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Dietary Changes in Older Americans From 1977 to 1996: Implications for Dietary Quality

Shirley A. Gerrior
Center for Nutrition Policy
and Promotion

Older people are a rapidly growing segment of the U.S. population. In 1996 persons over age 65 made up 12 percent of the population. As a result, more attention is being paid to their nutritional well-being and health, particularly regarding the possible link between nutrition and the development of chronic disease. The U.S. Department of Agriculture's (USDA) 1977-78 Nationwide Food Consumption Survey and the 1989-91 and 1994-96 Continuing Survey of Food Intakes by Individuals were used to examine the dietary quality of Americans over age 65 and to evaluate changes in their food and nutrient intakes from 1977-78 to 1994-96. Results showed that the largest changes were decreased consumption of whole milk, followed by red meat and eggs, and increased consumption of sweetened beverages, followed by grain mixtures and snacks, and reduced-fat milks. In general, the same nutrients were below the Recommended Dietary Allowances (RDA) during both periods. In 1994-96, intakes of vitamin E and zinc were below the RDA for men and women. Future increases in the consumption of whole grains, nonfat or reduced-fat milks, and vegetables and decreases in sweetened beverages and fats will help improve overall diet quality and help reduce the risk of chronic diseases associated with poor eating patterns.

More attention is being paid to the nutritional status and nutrition-related health needs of older Americans, as well as to the relationship between nutrition and the development of older Americans' many chronic diseases. Older people are a rapidly growing segment of the U.S. population. In 1996, 12 percent of the U.S. population was over age 65; in 1900, 4 percent of the population was over age 65 (18,19). By 2050 the older population will more than double, with most of the growth occurring between 2010 and 2030 when members of the baby-boom generation enter their elderly years (18). Among older Americans, women outnumber men by 6 million (18.9 versus 12.9

million) because of a higher death rate among older men (18,19). It is therefore important to examine the dietary quality of Americans over age 65 and to evaluate changes in their food and nutrient intakes over time. A better understanding of the dietary quality and food and nutrient intakes of elderly Americans will help identify those at nutritional risk and those whose nutritional status may be improved by preventive nutritional interventions. Accordingly, policymakers and nutrition professionals will need to target food and nutrition programs for elders, establish policies related to food fortification, and develop nutrition- and health-related strategies that help elders better meet the nutritional challenges associated with aging.

The importance of proper nutrition throughout the life cycle is key in determining quality of life. Proper nutrition helps to diminish health problems and physiological decline associated with poor diets and poor health habits over a lifetime. And in the later years, good nutrition helps to maintain a more healthful lifestyle and one with greater independence. An increasing percentage of elderly people, as they age, face chronic, limiting illnesses or conditions such as arthritis, poor dentition, reduced gastrointestinal functioning, diabetes, osteoporosis, senile dementia, and depression. These conditions may result in an overall decrease in their intake of food energy and essential nutrients. These conditions will, as well, impair an older person's ability to purchase and prepare nutritious foods, the result of which may be dependency on others for help performing daily activities (6,11).

In general, data on food intake from national dietary surveys (2,14), as well as others (4,12), suggest that older Americans consumed less food than required to meet recommendations for food energy and nutrients. Many older Americans, including the presumably healthy, have reported nutrient intakes below the recommendation for food energy, vitamin E, vitamin B₆, calcium, magnesium, and zinc (14). These low intakes, however, may be a problem of the survey methods used, that is, underreporting of the foods consumed.

Recent findings from the Third National Health and Nutrition Examination Survey (NHANES III) indicate that 18 percent of the men and 28 percent of the women underreported their energy intakes (2). Underreporting of energy intake was highest in women and persons who were older, overweight, or trying to lose weight.

Also, intakes of vitamins, minerals, fiber, and macronutrients were significantly lower and, in general, paralleled energy intakes. Although underreporting of food quantities and food energy has been observed among the elderly, it is not a unique problem of this segment of the population.

Despite underreporting by the elderly, they may actually eat less as they age because of a number of factors, including a decline in physical activity and a decrease in appetite. Also, surveys show that energy intakes are consistently low for the elderly (2,3,12,14,15), suggesting a real decline in food and nutrient intakes with age. This contrasts with a higher mean energy intake by the general population that is seen in the more recent surveys where additional probes were used for purposes of enhancing recall (2,15). Thus despite the limitation of survey respondents underreporting food quantities and food energy, dietary survey data are useful when assessing the dietary quality and food and nutrient intakes of the elderly, and the data provide important information on the nutritional status of the elderly.

This study examines the dietary quality of Americans over age 65 and evaluates changes in their food and nutrient intakes from 1977-78 to 1994-96. Nutrient intakes and consumption of major food groups and subgroups from 1977-96 are examined in terms of current dietary guidance. By increasing our knowledge of the dietary behaviors of older people and observing changes in these behaviors over time, we can more effectively evaluate nutrition education efforts and determine future directions for nutrition intervention, the goal of which is to improve the quality of life for this segment of the population.

Methods

Data Source

Data for this study were from the USDA's Nationwide Food Consumption Survey of 1977-78 (NFCS 77-78) (16,17) and the 1989-91 and 1994-96 Continuing Survey of Food Intakes by Individuals (CSFII) (14,15). The NFCS 77-78 included individuals selected from stratified-area probability samples of noninstitutionalized households in the 48 conterminous States. For the NFCS 77-78 four waves were conducted, one for each season, and each on a different sample of participants (8,9). Individual dietary data for 3 consecutive days were obtained through a mix of a 24-hour recall and 2-day food records.

The CSFII for 1989-91 and 1994-96 comprise a nationally representative sample of noninstitutionalized persons residing in the United States for each year of the 3-year data sets. For the 1989-91 CSFII, the USDA used a 1-day recall and a 2-day dietary record to collect food intake data for 3 consecutive days (14). The 1989-91 CSFII included an all-income and a low-income sample, which were combined through sample weights. For the 1994-96 CSFII, USDA collected 2 nonconsecutive days of dietary data for individuals of all ages.

The data were collected between January 1994 and January 1997; in-person interviews were used to collect the 24-hour recalls. Only the first day of dietary intake data was used because day-1 data (for each of the surveys used) were collected using the 24-hour recall method. Methods of data collection used on subsequent days were not as comparable. Research has indicated that food intake data based on 1-day dietary intakes provide reliable intakes by groups of people (1). Thus, to best examine

changes over time from surveys with different numbers of days of dietary information, this study compared estimates of food and nutrient intake among the surveys based on only the first day's data collected for each individual.

The data were collected from selected individuals in each household. The method for collecting the 24-hour recall was modified from previous surveys to improve the collection of dietary intake data and included more questions that probed the respondents' recollection (15).

Sample

In this study, older men and older women made up 10 to 12 percent of the U.S. population between 1977 and 1996: men, 4 to 5 percent; women, 6 to 7 percent. The sample selected for analysis consisted of persons older than age 65 who provided a valid 1-day, 24-hour recall of dietary intake. For each of the three surveys, the USDA developed sample weights to adjust for survey response and for other vagaries of sample selection. Use of weighted data provides results that are more characteristic and generalizable to the U.S. population.

Nutrient Analysis

This study examined food energy, 15 nutrients, and dietary components. Nutrient data were not available in the NFCS 77-78 for saturated fat, cholesterol, folate, vitamin E, zinc, dietary fiber, and sodium. The nutritive value of the foods the elderly said they consumed was calculated using the USDA's Nutrient Data Bank and survey databases for 1977-78, 1989-91, and 1994-96. Average nutrient intakes for 1 day were computed for these three periods.

Nutrient intakes as a percentage of the 1989 Recommended Energy Allowance (REA) or Recommended Dietary Allowances (RDA) were used in this study.

They were derived by dividing an individual's intake by the REA or RDA for the appropriate age/gender group.

Food Analysis

Ten major food groups (used by USDA) and 27 food items that reflect the total diet were analyzed (table 1). For the CSFII surveys, USDA has developed a Food Grouping System for separating mixtures into their component parts (14). However, in this study, for purposes of comparability between the NFCS and CSFII, food mixtures were not separated into individual ingredients. For example, grain and meat mixtures were placed into a grain or meat mixture category based on the primary ingredient (e.g., a macaroni and cheese mixture was assigned to the grain mixture group; the macaroni was not assigned to the grain group, and the cheese was not assigned to the milk group). Average intake in grams for each of the food groups and subgroups was calculated from 1-day recall for 1977-78 and 1994-96.

Statistical Analysis

Descriptive statistics were derived using the Statistical Package for the Social Sciences (SPSS) (13). Tests for significance were not performed. The differences in the sampling methods of the surveys and the use of sample weights limit the degree to which the survey data can be compared.

For this article, a "trend" was defined as a "change" in the consumption of a food or in nutrient intake. For a given food group (or food), a trend existed when the mean intakes of the food group or food rose or fell continually from 1977-78 through 1989-91 and to 1994-96. Further analysis with more complex methods (i.e., time trends or time series analysis) may reveal additional information.

Both older men and women increased their intakes of vitamins A, C, and B₆; calcium; iron; phosphorus; and magnesium.

Table 1. Percentage change in average intake (grams per day), 1977-78 to 1994-96, for Americans over age 65

	NFCS 1977-78 Men	NFCS 1977-78 Women	CSFII 1994-96 Men	CSFII 1994-96 Women	Men	Women
Sample size	1,514	2,167	1,101	1,026		
	-----Grams-----				-----Percent change-----	
Total meat	223	155	204	151	-9	-3
Red meat	82	51	39	24	-52	-53
Luncheon meats	21	11	21	13	0	18
Poultry	27	24	22	22	-19	-8
Fish	10	9	15	12	50	33
Mixtures	67	46	102	77	52	67
Total milk and milk products	253	216	260	211	3	-2
Total fluid milk	210	157	185	148	-12	-6
Whole milk	109	75	43	29	-60	-61
Reduced-fat milks	53	51	93	70	65	37
Cheese	14	17	15	13	8	-24
Milk desserts	24	20	37	28	54	40
Eggs	39	21	21	15	-46	-29
Legumes, nuts, and seeds	28	16	42	26	50	63
Total grains	232	182	301	232	30	27
Breads and rolls	65	49	61	48	6	-2
Other baked goods	65	45	48	35	-26	-22
Cereals and pasta	67	55	102	71	52	29
Grain snacks	3	3	8	6	167	100
Mixtures	31	31	64	57	106	84
Total vegetables	248	219	252	210	2	-4
White potatoes	72	57	66	47	-8	-18
Tomatoes	29	29	35	30	21	3
Dark-green vegetables	11	12	16	18	45	50
Deep-yellow vegetables	12	15	15	11	25	-27
Other vegetables	123	106	120	104	-2	-2
Total fruits	169	177	214	195	27	10
Citrus	66	74	79	78	20	6
Other fruits	103	103	130	113	26	10
Fats and oils	15	12	17	14	13	17
Table fats	9	6	7	5	-22	-17
Salad dressing	6	4	9	9	50	125
Sugars and sweets	30	20	23	18	-23	-10
Nonalcoholic beverages	617	571	717	629	16	10
Coffee	443	374	419	344	-5	-8
Tea	117	141	131	147	12	4
Carbonated soft drinks	41	41	121	93	195	127
Fruit drinks	16	17	44	39	165	129

Note: Food item totals may not equal food group totals because of rounding.

Table 2. Mean nutrient intakes by gender for older Americans over age 65, 1977 to 1996

	1977 ¹ Men	1977 ¹ Women	1989-91 ² Men	1989-91 ² Women	1994-96 ³ Men	1994-96 ³ Women
Sample size	1,037	1,726	780	1,377	1,101	1,026
	<i>Mean</i>					
Food energy (kcal)	1,910	1,401	1,823	1,392	1,854	1,407
Total fat (gm)	88.3	61.6	68.2	51.9	68.3	50.2
Saturated fat (gm)			23.6	17.6	22.5	15.9
Cholesterol (gm)			284	194	256	185
Dietary fiber (gm)			17.5	13.5	18.6	14.0
Vitamin A (IU)	6,338	6,015	8,505	7,651	8,613	6,464
Vitamin C (mg)	87	87	110	102	107	95
Vitamin B ₆ (mg)	1.63	1.30	1.9	1.5	1.98	1.53
Vitamin E (mg)			8.7	7.1	8.9	6.7
Folate (µg)			309	240	298	222
Calcium (mg)	709	555	733	596	778	587
Iron (mg)	12.7	9.4	16.3	12.0	16.6	12.6
Phosphorus (mg)	1,194	897	1,204	927	1,214	940
Magnesium (mg)	257	202	287	224	291	229
Zinc (mg)			13.0	8.6	11.0	8.3
Sodium (mg)			3,275	2,263	3,179	2,344

¹Mean intakes per individual in a day, 1-day data, 1977-78 NFCS.

²Mean intakes per individual in a day, 1-day data, 1989-91 CSFII.

³Mean intakes per individual in a day, 1-day data, 1994-96 CSFII.

Results

Changes in Average Daily Nutrient Intakes, 1977-96

From 1977-96, older men's average intakes of food energy decreased (1,910 to 1,854 kcal); older women's intakes remained essentially unchanged (1,401 to 1,407 kcal) (table 2). These intakes are below the 1989 REA for men (2,300 kcal) and women (1,900 kcal) (7). Both older men and women increased their intakes of vitamins A, C, and B₆; calcium; iron; phosphorus; and magnesium. They decreased their intake of total fat: men by 20 grams and women by 11 grams. From 1989-96 intakes of dietary fiber

increased slightly; intakes of folate, saturated fat, and cholesterol decreased. Also, intakes of zinc and sodium for men were lower in 1994-96 than they were in 1989-91.

Average Intakes as a Percentage of Recommendation, 1977-96

Older Americans' diets failed to meet the 1989 REA for food energy for each of the survey years, with women's intake less than 75 percent of the REA (table 3). Both older men and women exceeded the recommendation for total fat (107 to 129 percent) and for saturated fat (103 to 118 percent) for all years. However, total fat and saturated fat intakes as a

percentage of recommendation declined, an indication that in the past decade some progress was made in achieving the goals for fat intake. Whereas both older men and women met the cholesterol recommendation (300 milligrams or less per day), only older women met the sodium recommendation (2,400 milligrams per day). Older men and women failed to meet the dietary fiber recommendation of 25 grams per day: intakes ranged from 54 to 74 percent of the recommendation. Older men and women also failed to meet 100 percent of the RDA for vitamin B₆, vitamin E, calcium, magnesium, and zinc. In 1994-96, calcium and zinc intakes for the

Table 3. Average intake as percentage of recommendation by gender for older Americans over age 65, 1977 to 1996

	1977 ¹ Men	1977 ¹ Women	1989-91 ² Men	1989-91 ² Women	1994-96 ³ Men	1994-96 ³ Women
Sample size	1,037	1,726	780	1,377	1,101	1,026
	<i>Percent</i>					
Food energy ⁴	83	74	79	73	82	74
Total fat	129	129	112	112	111	107
Saturated fat			118	113	110	103
Cholesterol			95	65	85	62
Dietary fiber			70	54	74	56
Vitamin A	127	150	170	191	181	183
Vitamin C	144	146	182	169	172	160
Vitamin B ₆	82	81	96	93	99	95
Vitamin E			87	89	88	82
Folate			154	133	143	128
Calcium	89	69	92	74	96	75
Iron	127	94	163	120	167	125
Phosphorus	149	112	150	116	153	117
Magnesium	73	72	82	80	83	82
Zinc			87	72	77	70
Sodium			136	94	132	98

¹ Mean intakes per individual in a day, 1-day data, 1977-78 NFCS.

² Mean intakes per individual in a day, 1-day data, 1989-91 CSFII.

³ Mean intakes per individual in a day, 1-day data, 1994-96 CSFII.

⁴ Nutrient recommendations are based on the 1989 Recommended Dietary Allowances; total fat is ≤ 30 percent of total calories; saturated fat is < 10 percent of total calories. Dietary fiber is based on daily intake of 25 grams; sodium, 2,400 milligrams; and cholesterol, ≤ 300 milligrams.

elderly women were 75 percent or less of the RDA. Despite these shortfalls, intakes of calcium, vitamin B₆, and magnesium were higher in 1994-96 than they were in 1977-78 and contributed to meeting a greater percentage of the recommendation.

The Percentage of Older Americans With Diets Meeting 100 Percent of the Recommendation, 1977-96

The percentage of older men and older women with intakes of food energy that met 100 percent of the REA was low:

25 and 17 percent, respectively in 1994-96, and it essentially remained the same over the 20-year period (table 4). From 1977-78 to 1994-96, the percentage of older men and women meeting 100 percent of the recommendation for intakes of total fat, vitamin B₆, and iron increased notably. In 1989-91 and 1994-96, a higher percentage of older women than older men met 100 percent of the recommendation for nutrients that need to be consumed in moderation: Total fat, saturated fat, cholesterol, and sodium. The percentage of older men and

women meeting 100 percent of the recommendation for mineral intake (calcium, magnesium, and zinc) was low throughout the study period.

Changes in Average Intake (in grams per day) from 1977-96

Total meat products. In 1994-96 older Americans ate less total meat and 50 percent ate less red meat (beef and pork) than they did in 1977-78 (table 1). Not expected was the decrease during this period in poultry consumption by older Americans (19 percent less for men and

Table 4. Percentage of older Americans by gender over age 65, with diets meeting 100 percent of the recommendation for intake, 1977 to 1996

	1977 ¹ Men	1977 ¹ Women	1989-91 ² Men	1989-91 ² Women	1994-96 ³ Men	1994-96 ³ Women
Sample size	1,037	1,726	780	1,377	1,101	1,026
	<i>Percent</i>					
Food energy ⁴	26	16	21	13	25	17
Total fat	13	18	36	39	37	43
Saturated fat			40	43	43	50
Cholesterol			62	83	67	80
Dietary fiber			20	6	20	11
Vitamin A	40	46	49	51	50	51
Vitamin C	57	58	64	67	62	61
Vitamin B ₆	26	27	37	36	42	38
Vitamin E			23	26	27	28
Folate			62	58	60	57
Calcium	27	17	36	21	40	22
Iron	65	37	69	51	76	56
Phosphorus	80	55	77	58	80	62
Magnesium	17	19	25	23	28	27
Zinc			21	19	20	17
Sodium			30	61	33	55

¹Mean intakes per individual in a day, 1-day data, 1977-78 NFCS.

²Mean intakes per individual in a day, 1-day data, 1989-91 CSFII.

³Mean intakes per individual in a day, 1-day data, 1994-96 CSFII.

⁴Nutrient recommendations are based on the 1989 Recommended Dietary Allowances; total fat is ≤ 30 percent of total calories; saturated fat is < 10 percent of total calories. Dietary fiber is based on daily intake of 25 grams; sodium, 2,400 milligrams; and cholesterol, ≤ 300 milligrams.

8 percent less for women). The average intake of fish and meat mixtures, however, increased substantially. Because meat mixtures may include appreciable amounts of red meat or poultry, actual consumption of these discrete foods may be higher than the individual food items indicate.

Total milk products. A noticeable shift from whole milk to reduced-fat milks occurred between 1977-78 and 1994-96, with the elderly drinking 60 percent

less whole milk and 37 to 65 percent more reduced-fat milks. Despite this shift in milk types during this period, both older men and women consumed less fluid milk overall.

Eggs; legumes, nuts, and seeds. From 1977-78 to 1994-96, egg consumption decreased for both elderly men and women—more so for the men than for the women: -46 versus -29 percent. This is in contrast to the increased consumption of legumes, nuts, and seeds: 50 percent for men and 63 percent for women.

Total grains. Older men and women ate more grain products, especially grain mixtures and snacks (i.e., pizzas and pretzels), in 1994-96 compared with 1977-78. They also ate more cereals and pastas, with the change in men's intake double that of women's: 52 versus 29 percent.

Total vegetables and total fruits. Total vegetable intake between 1977 and 1996, on average, remained relatively constant for elderly Americans—they ate less white potatoes but more tomatoes

Older Americans may be at risk for micro-nutrient deficiencies....

and deep-green vegetables. Older men and women consumed about 50 percent more dark-green vegetables and older men about one-fourth more deep-yellow vegetables and one-fifth more tomatoes. Also, older men and women ate more total fruit, with their intake of both citrus and noncitrus fruits higher in 1994-96 than in 1977-78.

Fats and oils. Elderly Americans ate slightly more fats and oils in 1994-96 than they did in 1977-78, with a shift from table fat to salad dressings. For both men and women, their use of table fats (margarine and butter) in 1994-96 was about one-fourth less than their use in 1977-78.

Nonalcoholic beverages. While older Americans ate less sugar and sweets in 1994-96 than they did in 1977-78, their consumption of carbonated soft drinks and fruit drinks increased appreciably, counterbalancing the positive effects of consuming less sugar and sweets.

Discussion and Conclusions

Older Americans appear to be moving towards dietary guidance and closer to the *1995 Dietary Guidelines for Americans* by incorporating nutrition education messages into healthful eating behaviors. From 1977-78 to 1994-96, older Americans made considerable changes in their diets. In 1994-96, their consumption of red meat, eggs, and sugars and sweets was lower than it was in 1977-78. Their consumption of legumes, total grains, and fruits was higher in 1994-96 than it was in 1977-78. This selection of food provided less fat, saturated fat, cholesterol, zinc, and sodium to their diet and more vitamins A and C, folate, dietary fiber, calcium, and other bone-related nutrients.

Despite these dietary changes, average intakes of food energy, dietary fiber, vitamins B₆ and E, calcium, magnesium, and zinc were lower than recommendations. In particular, low calcium intakes are a concern for both older men and women, especially in terms of bone health. The declining use of fluid milk products, coupled with the increasing use of soft drinks and fruit drinks is a troubling trend. The consumption of soft drinks and fruit drinks is likely to displace more nutritious foods (e.g., milk products and fruits) from the diet and negatively affect diet quality.

Also, low intakes of dietary fiber and zinc require attention. While the intake of dietary fiber may be due to the low food energy intakes of this sample, these intakes are considerably below intakes expected of individuals consuming the recommended servings of fruits, vegetables, and whole-grain foods, based on the Food Guide Pyramid.

Older Americans have included more of these foods in their diets over the past 10 years. They, however, must continue to make more appropriate food choices and work harder to meet nutrient recommendations by increasing the number of servings of fruits, vegetables, and whole grains consumed, as well as by increasing their servings of milk and meat products. For example, including plenty of fortified cereal foods in the daily diet may counterbalance the loss of zinc from red meat and may also make important contributions to their intakes of magnesium and folate—thereby improving dietary quality. Overall, the low intake of food energy may prevent the older American from achieving the balance of foods needed for optimal diet quality, as indicated by the many nutrients below the recommendation.

In addition, the older Americans' marginal and low dietary intakes of many minerals and vitamins are a concern. Older Americans may be at risk for micronutrient deficiencies not only from low dietary intakes but also from other non-food factors, such as the ability to buy and prepare food, the presence of disease, or limited income. While the marginal and low dietary intakes of some nutrients (vitamin E, calcium, magnesium, and zinc) in this study are suggestive of clinical deficiencies, such a risk has not been confirmed by biochemical or clinical markers. However, studies using biochemical markers provide some evidence regarding the link between low dietary intake and biochemical status.

The Boston Nutritional Status Survey of the Elderly and related work (10,12) suggest that older people, even in a relatively well-off and generally well-nourished population, may not be getting as much vitamins as they need. For example, plasma levels of pyridoxal phosphate and other measures of vitamin B₆ status have been shown to decline with age. Erythrocyte activity (ETK-AC), a biochemical marker of thiamin, has shown a significant relationship between thiamin intake and blood levels. Using this marker, the researchers in the Boston study (12) categorized 5 percent of the study population as deficient, but the study noted that a correlation is more likely to exist between ETK-AC value and supplemental thiamin than between ETK-AC and dietary thiamin. Also, intake of riboflavin has been shown to have a significant effect on the erythrocyte glutathione reductase activity¹ coefficient (EGR-AC) in the population regardless of gender—with a deficiency noted in 5 to 16 percent of elderly people in technologically advanced countries (10).

¹ A biochemical marker of riboflavin activity.

For folate, the concentration of folate in erythrocytes is considered a better indicator of folate stores in the tissue. Serum levels accurately reflect recent dietary intake. Currently, the level of homocysteine is linked to a person's folate status, with serum homocysteine levels correlated closely with folate intakes less than 400 µg per day.

As with vitamins, the dietary intake of minerals also has shown a correlation with biochemical markers. Phosphorus intakes relate closely to blood phosphorus levels as does dietary iron and its storage to plasma ferritin levels (12). The requirements for calcium in terms of bone mineral loss over time have been linked to the biochemical marker, 25-hydroxy vitamin D—the levels of which are lower in older persons than in younger persons (10).

An older person's risk for inadequate dietary intake is well established. The results presented from this study emphasize the fact that the quality of older Americans' diet continues to need improvement. Nutrition intervention strategies need to be developed that improve nutrient intake for the older American. These strategies should emphasize the total diet and overall diet quality; they should help reduce the risk of chronic diseases associated with poor eating patterns. A diet needs to be low in fat and saturated fat and contain foods that provide adequate amounts of essential minerals, vitamins, and dietary fiber. For older people, efforts should be targeted to increase their intakes of food energy, dietary fiber, vitamin E, folate, calcium, magnesium, and zinc.

Limitations of Study

This study has two major limitations in terms of the implications presented: (1) the survey data and (2) the use of the RDA versus the Dietary Reference Intake (DRI) for assessment of dietary quality.

Survey data. The survey design and nutrient databases, underreporting by survey respondents, and the use of 24-hour recall data are included in this limitation. The use of different surveys and nutrient databases may make the data of the earlier years less comparable to the data of later years, especially in terms of the intake of fat and cholesterol and possibly folate. The nutrient data for the later surveys reflect improved data as well as changes in the nutrient content of foods that are attributable to new varieties and species, to new fortification levels, and to changes in the practices of the food industry.

Dietary intake was assessed using data from 24-hour recalls. Such data are poor indicators of a given person's usual diet but are more useful to characterize a group's intake when the sample size is sufficient (5). When providing dietary information, survey respondents tend to underreport consumption of certain foods, especially those foods high in fat and calories; they also tend to overreport consumption of foods (e.g., fruits) that are high in nutrients. Underreporting has decreased somewhat in more recent surveys (CSFII 94-96 and NHANES III) because more probes and collection methods have been added. Underreporting, however, remains a problem in certain subgroups, primarily women and persons who are older, overweight, or on a diet to lose weight. Additional research is

needed to determine the extent of underreporting of foods consumed, food-preparation methods and ingredients, food quantities, and the effect of under-reporting on estimates of food and nutrient intakes (2).

RDA vs. DRI. Adopted by the Food and Nutrition Board, Dietary Reference Intakes (DRI) represent the new approach to providing quantitative estimates of nutrient intakes for use in a variety of settings, thus replacing and expanding on the past 50 years of periodic updates and revisions of the RDA. The new DRI differ in amounts and age categories from the 1989 RDA and include three new categories of reference values: Adequate Intake (AI), the Estimated Average Requirement (EAR), and the Tolerable Upper Intake Level (UL).²

The design of this study does not allow calculation of the percentage of AI for calcium or calculation of the percentage of RDA for phosphorus, magnesium, folate, or vitamin B₆. However, older Americans' mean intake of these nutrients as a percentage of their DRI differs from their mean intake as a percentage of the 1989 RDA. Compared with the higher calcium AI value (1,200 mg/d for men and women age 51 and older), mean intake for both men and women met a much lower percentage of the DRI than for the 1989 RDA. This is also observed for the mean intakes of magnesium and folate, with a higher DRI magnesium RDA value (420 mg/d for men and 320 mg/d for women age 51 and older) and a higher DRI folate RDA value (400 µg/d for men and

women age 51 and older), respectively than for the 1989 RDA. The mean intake of phosphorus met a higher percentage of the DRI (700 mg/d for men and women age 51 and older) than of the 1989 RDA. Also, mean intakes of vitamin B₆ met a higher percentage of the DRI (1.7 mg/d [RDA] for men and 1.5 mg/d [RDA] for women) than of the 1989 RDA, with older men and women in 1994-96 exceeding the DRI.

²The EARs and AIs for the elderly may reflect a greater variability in requirement, especially for nutrient-related energy expenditures (20).

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Identifying the Poor and Their Consumption Patterns

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We used three increasingly restrictive measures to differentiate the poor from the nonpoor. Findings show that little difference exists among those classified as poor by any of the three poverty measures used. However, compared with the nonpoor, the poor—by all three measures—were younger, had more children under age 18, and had fewer vehicles and wage earners. The poor were more likely than the nonpoor to be Black, be single, have a high school education; and to rent or reside in government housing. By using the most restrictive measure of poverty, we found significant spending differences between the poor and nonpoor for food at home, housing, health, transportation, and other expenses.

The current poverty measure in the United States consists of a set of thresholds that are compared with household before-tax annual income and adjusted for household composition. Originally developed in the 1950's, the thresholds are based on the cost of a minimal diet times a multiplier of three to account for other expenses (4). The thresholds are adjusted periodically for inflation. In measure and design, however, the thresholds have not changed substantively since their inception.

Recently the official poverty measure has faced two broad criticisms. One: given the growth in in-kind and income transfer programs since the War on Poverty began in the 1960's, before-tax income no longer reflects accurately a household's economic resources (9). Two: the multiplier used in the official poverty measure is based on the assumption that households still spend one-third of their budget on food. Over time, however, the percentage of the household budget spent on food has declined, while the percentage of the

household budget spent on other items (i.e., housing, health care, transportation, and child care) has increased (2).

Alternative measures of poverty have been proposed to address these criticisms. For example, adding the value of in-kind transfers to before-tax income can help make income a better estimate of household economic resources (5). However, inaccurate reporting of income can cause practical problems when researchers use social survey data. Expenditure-based poverty measures have been proposed as another alternative to the current income-based measure (9,14,15).

The Consumer Expenditure Survey (CE), which provides extensive information on the expenditures of American consumers, is a logical data set to use to develop an expenditure-based measure of poverty. Lino (10) has proposed using total expenditures reported in the CE along with household income to assess poverty status. The measure based on total expenditures that is available in the CE, however, has been

criticized as being biased because the purchase price of high-cost durables is included in the measure when the purchase is made. A measure that focuses on regular out-of-pocket expenses, so-called total outlays, has been proposed as an alternative to total expenditures (13).

The purpose of this paper is twofold. First, it examines the characteristics of households classified as poor by three increasingly restrictive measures of poverty: The official income-based measure, a total-expenditure measure plus the current income-based measure, and a total-outlay measure plus the previous two measures. Second, this paper examines the spending behavior of households classified as poor by the most restrictive of these three measures. Comparisons between the poor and the nonpoor are made.

Method

Data and Sample

Data are from the Interview portion of the 1994 CE, which is conducted by the Bureau of the Census for the Bureau of Labor Statistics (BLS). An ongoing survey, the CE gathers information on expenditures, income, and major sociodemographic characteristics of consumer units¹ in the civilian non-institutionalized population. BLS uses a rotating panel design to survey about 5,000 consumer units each quarter.

¹A consumer unit is defined as either all members of a household who are related by blood, marriage, adoption, or other legal arrangement; a financially independent person living alone or as a roomer; or two or more persons living together and making joint expenditure decisions. In this paper, the terms consumer unit and household are used interchangeably.

Consumer units contribute five consecutive quarters of data; about 20 percent of the sample is replaced by new participants each quarter (16).

The CE treats each interview as an independent observation (16). We used CE weights to adjust the sample to reflect the population. We also omitted from this analysis consumer units whose household head was not White or Black, incomplete income reporters,² and consumer units with negative levels of household before-tax income, total expenditures, or total outlays.³ The resulting unweighted sample size was 16,367.

Poverty Measures

We used three measures of poverty in this study. The first measure compares household before-tax annual income to the official poverty guidelines. Adjustments for household size and the age

²Complete income reporters have provided information on major income sources such as wages and salaries, self-employment income, and Social Security income for the consumer unit for the previous 12 months. However, in addition to these major income sources, annual before-tax income also includes amounts received during the previous 12 months by members of the consumer unit for Supplemental Security Income, unemployment compensation, workers' compensation, veterans' payments, public assistance, interest and dividend income, pension income, rental income, alimony and child support received, and value of food stamps. A consumer unit that reports a value of zero for all sources of income is classified as an incomplete income reporter.

³These omissions were based largely on pragmatic reasons. Of the total sample, less than 4 percent were neither White nor Black. Incomplete income reporters and consumer units reporting negative levels of income or spending may have insufficient or incorrect income or expenditure data, thus limiting our ability to classify them appropriately as poor or nonpoor. Our decision to exclude incomplete income reporters and those with negative income or expenditures reduced the sample by about 2 percent.

of the household head in one- or two-person families are reflected in these guidelines. We classified those households reporting income below the relevant threshold as poor. This measure we termed the "single-hurdle" measure because only this one hurdle or standard must be cleared for the household to be considered poor.

Variations in income receipt and the inability or unwillingness of survey respondents to report completely and accurately how much income was received can cause income to be an unreliable measure of household economic resources (7,12,13). Further, in the CE, a consumer unit is classified as a complete income reporter when values have been reported for major income sources—even though information may not have been provided for all income sources (7,16). No attempt is made in the CE to impute income when it is missing. Obviously, when consumer income is understated (whether by error or intent), the consumer unit can be classified as poor when it is not.

Given these problems in measuring income, researchers have used total expenditures as a proxy for income (1,12). The theoretical basis for this substitution is the permanent income hypothesis. It suggests that consumers try to maintain a given level of consumption over time and are relatively unresponsive to transitory increases and decreases in income. Thus: compared with measures of annual income, annual total expenditures are a better representation of consumption patterns over the lifespan (7).

One drawback of using total expenditures instead of income when assessing poverty status is that a household might appear to be poor on the basis of total

expenditures when it is simply saving rather than spending (11). To overcome this drawback, Lino (10) suggested using total expenditures in addition to, rather than instead of, income when assessing whether a household is above or below the poverty thresholds. The second measure of poverty we used in this study classified a household as poor if its before-tax annual income and its total annual expenditures were below the relevant dollar values of the official poverty thresholds. This measure we termed a "double hurdle" because two criteria must be met for a household to be considered poor.

In the CE, the purchase price of consumer durables is included in total expenditures when the purchase is made. Purchase of high-cost durables (i.e., vehicles) can bias the total-expenditure measure upward. Conversely, the CE excludes principal payments on home mortgages from total expenditures. (Home mortgage interest is included in total expenditures.) Thus the total-expenditure measure can be biased downward for homeowners who make mortgage payments. Rogers and Gray (13) have proposed an alternative measure called "total outlays" that is designed to capture the "regular out-of-pocket outlays of consumers." This measure adds principal payments on home mortgages and on financed vehicles to total expenditures and subtracts the purchase price of financed vehicles. To construct our third measure of poverty, we computed total outlays for the sample. Then we classified a household as poor if its before-tax annual income, total expenditures, and total outlays were below the relevant official poverty guidelines. This measure we termed "triple hurdle" because three criteria must be met for the household to be classified as poor.

Introduction of each additional hurdle makes the definition of poverty more restrictive. Consequently, of those classified as poor by the single-hurdle measure, not all remain classified as poor when the double-hurdle measure is imposed. Of those designated as poor using the double hurdle, not all remain classified as poor when the triple-hurdle measure is applied.

Variables

Variables used only in the descriptive statistics included household head over age 64, household size, number of vehicles, being a renter, government housing, before-tax income, total outlays, Supplemental Security Income (SSI), welfare benefits, and food stamp value (table 1). Variables used only in the regression analysis included region of residence, Interview quarter, and the poverty measure. Remaining variables were used in both the descriptive statistics and the regression analysis.

Sociodemographic variables used as independent variables in the regression analysis included age, education, and race of the household head (defined as the husband in husband-wife households); number of children less than age 18; household type; number of earners; and region of residence. These variables were selected to control for differences in need and preferences. Reference categories for the categorical variables were having a high school education, being White, being a husband-wife household, and residing in a rural area. The CE does not report region for rural residents in order to preserve the privacy of survey respondents. Thus we used rural residence as the reference category for the four urban regions, a common practice when using CE data.

...when the most restrictive definition of the poor is used... the poor and nonpoor have significantly different spending patterns for food at home, housing, health care, transportation, and other expenses....

Economic variables used in the regression analysis included total expenditures and the poverty measure: a categorical variable coded 1 if the household was classified as poor by the most restrictive measure of poverty (the triple hurdle), 0 otherwise. Total expenditures were used as a proxy for income to address the problems of income measurement in the CE (1). The quarter⁴ in which the interview took place was included in the study to control for possible seasonal effects in spending behavior. Quarter 4 was the reference category.

We used eight expenditure categories as dependent variables in the regression analyses: Food at home, food away from home, apparel and apparel services, housing, transportation, adjusted transportation,⁵ health, and other. The “other” category included expenditures on tobacco, alcohol, education, reading, entertainment, personal care, personal

⁴Quarter 1 included months 1 through 3; quarter 2, months 4 through 6; quarter 3, months 7 through 9; and quarter 4, months 10 through 12.

⁵Analysis using the summary variable for transportation in the CE indicated that the poor spent more for transportation, all else equal. Because this result may have been related to the way the CE treats transportation expenditures, an alternative measure of transportation expenses was constructed. This alternative measure was conceptually similar to the total-outlay measure suggested by Rogers and Gray (13). Expenditures for public transportation were excluded from the summary measure of transportation, while principal payments for financed new and used cars and trucks were added, and the purchase price of financed new and used cars and trucks was subtracted. Specifically, adjusted transportation was the sum of annualized expenditures for net outlay for new and used cars and trucks; other vehicles; gas and motor oil; vehicle finance charges, maintenance and repairs; vehicle insurance; vehicle rental, leases, licenses, and other charges; principal payments for financed new and used cars and trucks; less the purchase price of financed new and used cars and trucks.

Table 1. List of variables

Variable	Measurement/description
<u>Sociodemographic</u>	
Age of household head	Continuous
Household head over age 64	Categorical 1 if true; 0 otherwise
Education of household head	Categorical Less than high school High school (reference category) Some college College
Race of household head	Categorical Black White (reference category)
Number of children under age 18	Continuous
Number of earners	Continuous
Number of vehicles	Continuous
Household type	Categorical Husband-wife (reference category) Male single parent Female single parent One person Other
Household size	Continuous
Region of residence	Categorical Northeast urban Midwest urban South urban West urban Rural (reference category)
Renter	Categorical 1 if rent; 0 otherwise
Government housing	Categorical 1 if have; 0 otherwise
<u>Economic</u>	
Before-tax income	Continuous
Total expenditures	Continuous
Total outlays	Continuous
Supplemental Security Income	Continuous
Welfare benefits	Continuous
Food stamp value	Continuous

Table 1. List of variables (Cont'd)

Variable	Measurement/description
<u>Other independent</u>	
Poverty measure	Categorical 1 if poor by triple-hurdle measure; 0 otherwise
Interview quarter	Categorical Quarter 1 Quarter 2 Quarter 3 Quarter 4 (reference category)
<u>Expenditure</u>	
Food at home	Food and beverages purchased and prepared by the consumer unit for its own use
Food away	Food and beverages purchased by the consumer unit at restaurants, cafes, and fast-food establishments
Apparel and apparel services	Expenditures for shoes, clothing, sewing supplies, laundry, and dry cleaning
Housing	Expenditures for mortgage interest, property tax, maintenance, repairs, insurance and other related expenses, rent, utilities, household operations, and home furnishings
Health	Expenditures for health insurance, medical services, prescription drugs, and medical supplies
Transportation	Expenditures for new and used cars and trucks, gasoline, maintenance and repairs, vehicle insurance, and vehicle rental
Adjusted transportation	Expenditures for transportation plus principal payments for financed new and used cars and trucks less purchase price of financed cars and trucks
Other	Expenditures for tobacco, alcohol, education, reading, entertainment, personal care, personal insurance, cash contributions, and miscellaneous goods and services
Total expenditures	Sum of expenditures for food at home, food away, apparel and apparel services, housing, health, transportation, and other goods and services

insurance, cash contributions, and miscellaneous items. Multiplying the total dollar amount spent on each of the eight expenditure categories by four annualized the quarterly expenditure data.

Statistical Analysis

To compare the characteristics of the poor and nonpoor, we computed weighted means for relevant variables for four groups: Those classified as poor when the single-hurdle measure of poverty was used, those classified as poor when the double-hurdle measure of poverty was used, those classified as poor when the triple-hurdle measure of poverty was used, and those not classified as poor by any of the three measures. To compare spending patterns of the poor and nonpoor, we included in each regression analysis a dummy variable indicating the household was poor by the most restrictive measure of poverty. Because all expenditure categories used in this study had a relatively low percentage of zero spending, ordinary least squares (OLS) regression results were not biased (8). Including the poverty measure in the regressions indicated whether significant differences existed in the spending behavior of the poor and nonpoor after controlling for the age, education, and race of the household head, the number of children less than age 18, household type, number of earners, region of residence, and quarter in which the interview was conducted.

Nearly half of the sample that is classified as poor by the income threshold measure is no longer classified as poor when...total expenditures and total outlays must also be below the poverty thresholds.

Findings

Comparison of Characteristics

When the single-hurdle measure of poverty was used, 15 percent of the sample was classified as poor.⁶ When the second hurdle was imposed, about half as many—7.4 percent of the sample—was still classified as poor. Imposing the third hurdle reduced the percentage of poor to 7.2 percent.

We found little difference among the characteristics of those classified as poor by any of the three measures (table 2). This result is not surprising: the double- and triple-hurdle measures identify a subset of those initially identified as poor by the single-hurdle measure. In general, the poor households were headed by someone who was about 45 years old. Average household size is close to 3. Compared with households classified as poor by the single-hurdle measure, households classified as poor by either the double- or triple-hurdle measure had a slightly larger household size with more children less than age 18 but with fewer vehicles and earners.

While households classified as poor by all three poverty measures reported less income than expenditures, the difference between before-tax income and total expenditures or total outlays is greatest for those classified as poor by the single-hurdle measure. However, this group reported the smallest average dollar amount of transfer income (SSI, welfare, food stamp) among the poor, suggesting credit or unreported income sources make up the difference. Nearly one-fourth of the poor household heads

were Black; over 40 percent had less than a high school education and lived alone. Over half of the poor were renters; about 10 percent lived in government housing.⁷

Those classified as not poor by all three poverty measures were slightly older and more likely to be living in husband-wife households than were those classified as poor. Relatively few had children under 18 years of age, suggesting these households were preparing their older children for adulthood. This group, on average, had the largest number of earners and vehicles. Mean before-tax household income was \$40,424 with mean total expenditures and mean total outlays of \$32,804 and \$32,629, respectively. Interestingly, a few in this group reported receipt of welfare benefits and housing support. Perhaps some of the household units in this group include one or more members (i.e., an elderly parent living with an adult child or a parent and child living with the child's grandparents) who could qualify for government transfers.

Comparison of Spending Behavior

Expenditure categories used in this study focused on the basic necessities of food, clothing, shelter, transportation, and health care. Remaining expenditure categories were classified as other. Results of the OLS regressions indicate that when the most restrictive definition of the poor is used (the triple-hurdle measure), the poor and nonpoor have

⁶This percentage compares favorably with the 14.5 percent reported for the U.S. population in the *Statistical Abstract of the United States 1996*, Table No. 736, "Persons Below Poverty Level, by Race and Family Status 1979 to 1994," p. 475.

⁷These results differ somewhat from Lino's (10). The differences are likely the result of focusing on different groups for analysis. Lino studied households with children. Our study includes households with and without children. Consequently, in our study, the average age of the household head is older, and the household size is smaller.

Table 2. Means of selected variables for the poor and nonpoor

	Poverty measure for the poor			Nonpoor
	Single hurdle (15% of sample)	Double hurdle (7.4% of sample)	Triple hurdle (7.2% of sample)	
	<i>Means</i>			
Age of household head	45.54	44.50	44.55	48.56
Household size	2.51	2.71	2.69	2.51
Number of children <18 years	0.96	1.19	1.19	0.64
Number of vehicles	0.98	0.66	0.63	2.15
Number of earners	0.77	0.65	0.63	1.41
Before-tax income	\$6,913.45	\$7,183.25	\$7,163.55	\$40,423.93
Total expenditures	\$14,124.59	\$8,259.19	\$8,165.59	\$32,803.81
Total outlays	\$14,185.75	\$8,419.23	\$8,274.01	\$32,628.84
Supplemental Security Income	\$360.07	\$482.33	\$474.81	\$96.12
Welfare benefits	\$793.66	\$1,144.77	\$1,162.43	\$63.28
Food stamp value	\$693.46	\$1,033.65	\$1,043.91	\$42.80
	<i>Percent</i>			
Household head >64 years	24	22	22	22
Household head Black	23	28	28	8
Household head education				
<High school	41	50	50	17
High school	27	27	27	31
Some college	23	20	19	25
College	8	3	3	27
Household type				
Husband-wife	26	21	20	57
Male single parent	1	1	1	1
Female single parent	17	22	22	4
One person	41	41	42	27
Other	15	15	15	11
Renter	55	60	61	30
Government housing	7	10	11	1

significantly different spending patterns for food at home, housing, health care, transportation, and other expenses (table 3). No significant differences in spending between the poor and nonpoor were found for food away from home, apparel and apparel services, and adjusted transportation.

With two exceptions—transportation and other expenses—the poor spent less than the nonpoor spent. Using the summary measure of transportation in the CE, we found that the poor spent, on average, \$1,904 more than did the nonpoor for transportation. Additional investigation suggested this unexpected result was due to differential expenditures for new and used cars and trucks and for public transportation. When transportation expenses were adjusted to remove expenses for public transportation and the net outlay for financed vehicles (comparable to the adjustment made to total expenses to compute total outlays), the spending difference between poor and nonpoor ceased to be statistically significant.⁸ Findings also indicated that the poor spent, on average, \$752 more than the nonpoor spent for other expenses (tobacco, alcohol, education, reading, entertainment, personal care, personal insurance, cash contributions, and miscellaneous).

⁸When amount spent for public transportation is the dependent variable in an ordinary least squares regression that has the same set of independent variables as are used in this article, the poor spent almost \$117 more per year than the nonpoor. The *t* value for this result is 2.366, significant at the 0.5 level. However, the adjusted *R*² for this model is quite low at 8 percent.

Table 3. Regression analysis of spending pattern differences between poor and nonpoor

Variable	Expenditure category			
	Food at home	Food away	Apparel and apparel services	Housing
	<i>Betas</i>			
Total expenditure	0.02***	0.03***	0.04***	0.18***
Age of household head	13.43***	3.11**	-0.94	1.00
Education of household head				
<High school	133.01*	-48.71	-91.10	-405.17*
Some college	55.34	68.42	219.05***	448.61**
College	136.86**	264.93***	400.42***	2402.77***
Household head Black	-38.90	-147.11*	207.36***	52.24
Number of children <18 years	539.85***	116.49***	68.24***	496.13***
Household type				
Male single parent	-348.96	322.25	-530.10*	-1542.99*
Female single parent	-429.04***	-110.70	79.89	-188.09
One person	-1130.89***	-349.88***	-188.73***	-1033.44***
Other	-228.84***	-64.75	-47.09	-563.65***
Number of earners	219.68***	119.12***	58.00*	-96.58
Region				
Northeast urban	499.11***	286.50***	256.93**	2728.70***
Midwest urban	-86.19	99.44	173.87*	1154.17***
South urban	44.28	126.65*	142.99*	1324.54***
West urban	307.83***	267.98***	35.95	2587.91***
Interview quarter				
Quarter 1	31.57	-64.38	424.86***	-203.76
Quarter 2	-2.34	-43.37	-157.42**	-131.60
Quarter 3	27.57	-95.53	-114.52*	-91.95
Poverty measure ¹	-295.91***	-89.39	-67.01	-1588.21***
Constant	1495.88***	605.43***	-60.09	1895.52***
Adjusted R ²	.32	.23	.24	.50

¹Triple-hurdle measure.

* p<.01.

** p<.001.

*** p<.0001.

Discussion

The income threshold measure of poverty is an absolute standard designed to reflect ability to meet basic needs. A household is poor if its before-tax income is below the threshold. As a measure of poverty, it is simple to

implement and easy to understand. It provides an objective measure for assessing qualification for welfare benefits. But there are problems with its use. To the extent that the income people report is incomplete or incorrect, a household may be classified erroneously as poor. Before-tax income may

not reflect accurately a household's economic resources if the household receives transfer payments. Calculation of the thresholds has also been criticized. At present, the cost of families' basic needs is calculated as three times the cost of a minimal diet, adjusted for household composition. However, in

Table 3. Regression analysis of spending pattern differences between poor and nonpoor (Cont'd)

Variable	Expenditure category			
	Health	Transportation	Adjusted transportation	Other expenses
	<i>Betas</i>			
Total expenditure	0.03***	0.44***	0.22***	0.26***
Age of household head	35.98***	-44.39***	-12.93*	-8.19
Education of household head				
<High school	-62.27	802.17	238.30	-327.92
Some college	-1.97	-1257.50***	-306.83	468.05*
College	-76.65	-4791.83***	-1522.25***	1664.28***
Household head Black	-483.82***	759.84*	-95.36	-349.61
Number of children <18 years	56.77	-739.05***	-335.41***	-538.42***
Household type				
Male single parent	-720.62*	1940.50	1206.68	879.92
Female single parent	-252.75	1071.07*	64.39	-170.38
One person	-636.75***	2555.43***	451.39*	784.26***
Other	-309.16***	1525.53***	310.70	-312.04
Number of earners	-250.61***	-778.24***	72.71	728.63***
Region				
Northeast urban	-479.95***	-3132.72***	-1889.52***	-138.58
Midwest urban	-290.16***	-1298.98***	-607.02*	247.85
South urban	-145.14	-1515.81***	-705.68**	22.49
West urban	-392.34***	-2559.26***	-1355.15***	-248.07
Interview quarter				
Quarter 1	30.97	-351.27	-94.56	132.01
Quarter 2	193.33*	132.89	79.40	8.51
Quarter 3	31.06	415.11	153.65	-171.74
Poverty measure ¹	-615.67***	1904.35***	97.84	751.84**
Constant	-82.76	-1685.66**	255.40	-2168.32***
Adjusted R ²	0.14	0.53	0.31	.52

¹Triple-hurdle measure.

* p<.01.

** p<.001.

*** p<.0001.

the years since the threshold was implemented, the percentage of food in the budget has declined, making the multiplier too small, and other expenditure categories (i.e., housing, health care, transportation, and child care) now vie with food for consideration as "basic expenses" (2).

An expenditure-based measure of poverty proposes several advantages over an income-based measure. It allows a wide definition of basic expenses to be considered. Consumers are often more willing to disclose expenditures than income. Expenditures tend to be free of the transitory increases and

decreases that can occur with income. But consumers can choose to spend less than income and thus be misclassified as poor when an expenditure-based measure is used. Including the net purchase price of high-cost durables in expenditures when the purchase is made, as is done in the CE, can bias

results. Further, while income represents a measure of resources that can be used to secure items needed for survival, expenditures simply reflect past purchasing decisions. Nothing is known about either the quantity or quality of items purchased. Families and individuals are designated as poor by using any expenditure-based measure without reference to any objective standard of need (which the official income thresholds attempt to reflect by using cost of a minimal diet as a basis). Another practical concern is that, in its present form, the CE does not have a sufficient sample size to provide detailed regional analysis of poverty (3).

In this study, as in Lino's study (10), the use of a poverty measure based on annual before-tax income and annual total expenditures mitigates the limitations present when either income or expenditures are used alone. This study carries this approach one step further by imposing yet another criterion for comparison with the poverty thresholds—total outlays. Use of total outlays provides limited correction for the problem of having the purchase price of a high-cost durable included in total expenditures. The resulting poverty measure is restrictive. Nearly half of the sample that is classified as poor by the income threshold measure is no longer classified as poor when the additional criterion is imposed—that total expenditures and total outlays must also be below the poverty thresholds.

Summary and Implications

The purpose of this paper was to compare the characteristics and spending behavior of households classified as poor and nonpoor by using three increasingly restrictive measures: An income-based measure (the current official poverty measure), the income-based measure plus a total expenditure-based measure, and the income- and total expenditure-based measure plus a total outlay-based measure. Findings indicate that little difference exists among those classified as poor by any measure. There are several differences in the characteristics of those classified as poor by any measure and those not classified as poor by any measure. After controlling for several socio-demographic variables, we found that spending patterns for food at home, housing, health, transportation, and other expenses were significantly different for those classified as poor by the triple-hurdle measure, the most restrictive measure of poverty, and the nonpoor. With the exception of transportation and other expenses, the poor spent less than the nonpoor spent.

It is beyond the scope of this research to propose which poverty measure should be used. Selection of a poverty measure must account for many factors, including the purposes for which the measure will be used, national living standards, and social norms regarding the ways in which, and the degree to which, those deemed poor should be

helped. However, we found relatively small differences in the characteristics of those classified as poor by either the double-hurdle or the triple-hurdle measure. This result suggests that while correcting for the cost of high-priced durables can be defended on logical and theoretical grounds, differentiating between total expenditures and total outlays may make little practical difference.

Comparing both income and expenditure levels with the official poverty thresholds offsets the limitations present when using a measure of income or expenditures alone to identify the poor. This approach helps minimize the possibility of misclassifying as poor those who underreport income but have high expenditures or those who have high incomes but choose a relatively low level of spending. The resulting poverty measure, however, is quite restrictive. If researchers or policymakers wish to identify those households in greatest need, this restrictive approach to identifying the poor may be helpful.

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Cruciferous Vegetables and Human Breast Cancer: An Important Interdisciplinary Hypothesis in the Field of Diet and Cancer

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Very early progress in cancer treatment and prevention was based primarily on a basic understanding of genetic changes in genes at cellular and biochemical levels. Today, however, an interdisciplinary approach from complementary research tracks is possible in the understanding of cancer treatment and prevention. Such an approach is particularly important for its potential to increase our knowledge about diet and cancer because it may lead to sounder dietary guidance. This interdisciplinary approach is well illustrated by a hypothesis linking cruciferous vegetables to breast cancer prevention. The hypothesis links indole-3-carbinol, a specific component of brassica vegetables, such as broccoli or cauliflower, to a beneficial effect on human breast cancer (estrogen metabolism). In addition to its value for preventing human breast cancer, the biologic elements of the hypothesis have specific implications for research on other cancers and for other diets.

Cancer: Trends, Complexity, and Research

All have concerns about cancer. Because of the incidence and devastating effects of cancer, its burden of suffering and death throughout the world is huge. In English-speaking countries, the incidence of cancer appears to be increasing at an alarming rate (26). However, because it takes several years to collect and analyze sufficient data to establish trends, the trend in English-speaking countries is only probable. For example, the incidence of prostate cancer increased from 27,000 to 41,000 per year in the 8 years preceding 1991 (2). In 1992, 180,000 new cases of breast cancer were reported in American women, compared with 142,000 in 1989 (20). There also seems to be a steady increase in mortality from most cancers in recent years, with the most rapid increase

occurring in steroid-related cancers (see table). Both these projections—increased incidence and increased mortality—are supported by a recent review on the topic (26).

Cancer is a very complex disorder; hence, research on its cure and prevention has had to use several approaches. Early researchers tried almost exclusively to understand cancer by studying biochemical and genetic effects of such cancer-causing emissions as X rays, ultraviolet radiation, radioactive emanations, and the effects of chemical agents (5,9,11,24). However, later scientists began to use statistical or epidemiological¹ approaches to examine whether environmental factors such as diet or life-style may affect cancer risk (7,10,15).

¹“Epidemiological” refers to the study of diseases within particular groups or populations.

Cancer deaths per year from the most deadly types

Types	1992			1996 (estimated)			Percent increase of total over 4 years
	Male	Female	Total	Male	Female	Total	
Lung	91,400	54,500	145,900	94,400	64,300	158,700	8.8
Pancreas and colo-rectal	41,100	42,400	83,500	41,600	42,300	83,900	0.5
Steroid-involved (Breast, ovary, and prostate)	34,200	56,500	90,700	41,400	59,100	100,500	10.8

Source: Boring, C.C., Squires, J.S., and Tong, T. 1992. *Cancer statistics. Cancer Journal for Clinicians* 42:19-35. Estimates are projections from 1990-1992 trends.

These latter approaches have led many to conclude that diet has a likely role in cancer. In particular, Doll and Peto (9) in the United States and a group of researchers in Sweden (5) believe that the disease could be reduced by as much as 35 percent by practical dietary means.

One of the problems with these statistical methods is that they do not provide precise understanding of what about the diet may be associated with change of cancer risk (22,25). For example, investigators are fairly certain that diet change can reduce the risk of breast cancer. But is fat the culprit in breast cancer? Is the relatively higher concentration of fruits and vegetables in improved diets responsible? Complementing these statistical approaches with biochemical and genetic data is an indispensable input into providing more sound dietary guidance. In this article we describe a specific theory about diet and breast cancer that illustrates the advantages of such a combined approach for practical dietary guidance.

Diet-Estrogen Link to Breast Cancer

In steroid-related cancers, the tissues affected are those associated with reproduction. Epidemiologically, changes in incidence of these cancers correlate directly with dietary change (12). In particular, the incidence of breast cancer in English-speaking countries is between 10 and 15 times the incidence in poorer countries such as Thailand or Ecuador, a fact attributed by some researchers to difference in diet (7) (see figure). However, a serious problem with these correlational studies is that we often do not know or control for risk factors related to breast cancer—including both low parity (small number of offspring) and late age at first birth—other than diet that operate in developed countries. In this commentary, we maintain that a better understanding of the physiology of breast cancer can help clarify what it is about the diet that may affect breast cancer.

Early physiologically based research has suggested a role for estrogen² in

breast cancer (1,19). Much later, research has suggested that diet probably influenced the levels of blood estrogen (19,20,23). In 1996, Beatson noted that removal of the ovaries containing the estrogen-releasing cells was beneficial in some cases of breast cancer (1). In 1990, Key et al. found that compared with British women, rural Chinese women had lower estrogen levels and one-fifth the incidence of breast cancer (15).

At the same time, strong biochemical evidence links estrogen to cancer of reproductive tissue. Estrogen activates the parts of the chromosome (DNA) that promotes cell division. We know, however, that more than one form of estrogen exists: estradiol, the form normally secreted, promotes cell division in a well-controlled manner, while 16-hydroxyestrone (C-16), another form of estrogen, seems to promote cell division in an uncontrolled manner that can lead to cancer in affected tissue (23).

²Estrogen is a steroid hormone that acts during the menstrual cycle to prepare the uterine and mammary tissues for possible pregnancy.

C-16 is one of the metabolites of normal estrogen, from which it differs only by the presence of a hydroxyl group on the number 16 carbon atom; C-2, the alternative estrogen metabolite, is a “safe” (inactive) substance.

Finally, we know that women with a family history of breast cancer have elevated blood C-16 (4); and the anti-estrogenic prescription drug 4-hydroxy tamoxifen (or simply tamoxifen) lowers blood C-16 and reduces both the incidence of breast cancer and the growth rate of existing breast cancer cells (13,14,21).

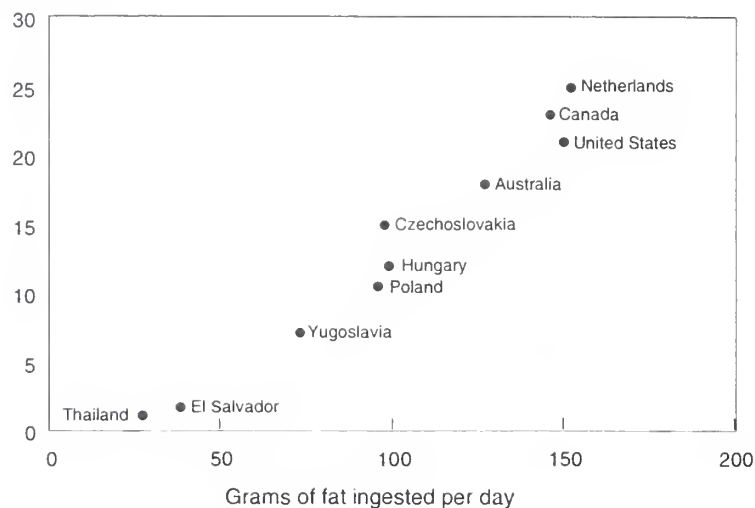
A Biochemically and Physiologically Based Breast Cancer-Diet Hypothesis

In the 1970's, Wattenberg reported that a diet of cruciferous (specifically brassica) vegetables³ was associated with an anti-breast cancer effect in animals (24). Wattenberg also identified a chemical compound in the vegetables, indole-3-carbinol (i-3-C), as the main contributor to their anti-cancer effect. Later authors have reported decreased formation of C-16 associated with increased vegetable diets (5). Such findings as these and those we discussed above led Michnovicz to hypothesize that cruciferous vegetables or purified i-3-C may reduce breast cancer initiation or the C-16/C-2 ratio by decreasing C-16 in the metabolism of estrogen (19,20). While there is already some experimental support for this hypothesis (3,19), larger clinical studies of i-3-C are necessary and are in progress (20).

³ Among these types of vegetables are cabbage, broccoli, cauliflower, and Brussels sprouts.

Cancer death rate versus fat intake

Death rate
(per 100,000,
age adjusted)



Importance of Breast-Diet Hypothesis

Scientifically based references such as the *Food Guide Pyramid* or the *Dietary Guidelines for Americans*, published by the U.S. Department of Agriculture, exemplify bodies of knowledge relating to dietary guidance that may change with time. Therefore, on the basis of much research (some of which we have described), we know that Americans should probably choose a diet low in fat and cholesterol and one with plenty of vegetables and grains. However, much of our knowledge lacks specificity. For example, are there *particular* diets that may protect against cancer?

The possible link among crucifers, estrogen, and breast cancer illustrates how change in our knowledge will probably occur. Therefore, even if the details of this hypothesis prove wrong, its epidemiological, physiological, and biochemical basis has already stimu-

lated new research and discoveries. To exemplify this, we first note that net C-16 removal is mediated by representatives of a particular enzyme group known as “mixed function oxidases” (MFO’s) (24) and that i-3-C activates these enzymes (8). MFO’s have a generalized tissue function of rendering toxic substances harmless (including many otherwise carcinogenic compounds). Questions important for cancer in general then have arisen that include “what other substances than i-3-C can activate the C-16 removing MFO’s? In what other tissues can general MFO activity be increased?” For example, it has been reported that ascorbigen, a vitamin-C group compound (6), activates MFO and that there is marked synergy in MFO activation by administration of both i-3-C and ascorbigen (even though ascorbigen is a nucleoside that itself contains i-3-C) (5,16,17). McDanell also reports MFO activation or a synergistic effect of joint i-3-C and ascorbigen on MFO

activity in a wide variety of tissues, including small intestine, large intestine, liver, and lung (17). We can then reasonably ask this: "Are there cancer prevention or treatment implications of i-3-C or ascorbigen for tissues other than breast tissue? Is MFO activation operative in the reported anti-cancer effect of a vegetable diet on a wide variety of these tissues? Can benefits be enhanced by combination i-3-C/ascorbigen supplementation or administration?"

General principles of the hypothesized beneficial linkage between crucifers and breast cancer may also be relevant to other diets or dietary aspects. Therefore, the central role of estrogen suggests that a fiber-rich diet may be protective, because dietary fiber increases removal and decreases reabsorption of stool estrogen. This biologic rationale complements some epidemiologic evidence that fiber is important, although epidemiologic assessment has been compromised by scarcity of data on the fiber content of individual foods (25). Similarly, suggestive data, indicating protection for a soy diet, have a biologic rationale in the ability of soy isoflavones to interfere with estrogen receptors (18). Finally, selection for future evaluation from the enormous number of phytochemical possibilities can be guided, in part, by knowledge of which chemicals affect estrogen content or biochemistry.

The possible cruciferous vegetable and estrogen linkage exemplifies how more sound and more specific guidance can result from combining pieces of the dietary puzzle from a variety of scientific disciplines. While we focused on only breast cancer here, the possible linkage between cruciferous vegetables and estrogen may have far wider significance for other diets and other cancers, because the principles discussed here are generally applicable.

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Diets of Individuals Based on Energy Intakes From Added Sugars

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“Pooh, do you want honey in your tea?” “Yes, Piglet, but without the tea.”

—Walt Disney *Winnie the Pooh* video series.

Data from the U.S. Department of Agriculture’s (USDA) Nationwide Food Consumption Survey (NFCs) and the Continuing Survey of Food Intakes by Individuals (CSFII) show a steady increase in people’s total energy intake since 1987 (9,10,12). Diet quality as measured by the Healthy Eating Index showed that, from 1989 to 1996, while the intakes of grain products increased appreciably, those of milk decreased (1).

Harnak et al. (3), in a study using CSFII 1994 data, reported that a high level of soft drink consumption by children and adolescents was associated with low intakes of milk and fruit juices and with low intakes of several nutrients: such as calcium, phosphorus, riboflavin, vitamin A, folate, and vitamin C. Non-diet soft drinks; fruit drinks; and foods such as cakes, cookies, and pies, placed under grain products in the CSFII, are high contributors of added sugars in the American diet.

According to per capita data from the U.S. food supply, consumption of added sugars in 1997 was 53 teaspoons per day, reflecting a 28-percent increase from 1982 (7). Added sugars are generally considered “empty calories,” because added sugars are good sources of energy and often are poor sources of micro-nutrients. This study examines the intakes of food groups and nutrients by individuals grouped by the caloric contribution of added sugars to their diet. The study also attempts to determine

whether high intakes of added sugars displace essential nutrients or nutrient-dense foods in the individual’s diet.

Method

CSFII Definition of Added Sugars

Added sugars include all sugars used as ingredients in processed and prepared foods such as breads, cakes, soft drinks, jam, and ice cream, and sugars eaten separately or added to foods at the table (10). Specifically, added sugars include white sugar, brown sugar, raw sugar, corn syrup, corn-syrup solids, high-fructose corn syrup, malt syrup, maple syrup, pancake syrup, fructose sweetener, liquid fructose, honey molasses, anhydrous dextrose, and crystal dextrose. Added sugars do not include naturally occurring sugars such as lactose in milk or the fructose in fruits.

Data Source

Data from USDA’s 1994-96 CSFII, a nationally representative food consumption survey, were used for this study (8). The dietary data were collected on 2 nonconsecutive days (3 to 10 days apart). A multiple-pass approach was used to collect two interviewer-administered 24-hour recalls. Individuals 2 years old and over who were selected for this study had a complete food intake record on day 1 of the survey.¹

¹Overall, the response rate for day 1 was 80 percent and included 15,016 individuals 2 years old and over (8).

Analysis revealed some extreme values for the day's total energy. Therefore, the top (more than 5,200 kcals) and bottom (less than 490 kcals) 1 percent of the individuals were excluded from the analysis. Also, excluded from the analysis were three individuals who had energy intakes entirely from added sugars. The analysis included 14,709 individuals.

The individuals were divided into three groups based on the percentage of calories consumed from added sugars. Group 1 (N=5,058) had less than 10 percent of its total calories from added sugars; group 2 (N=4,488), between 10 and 18 percent; and group 3 (N=5,158), more than 18 percent of its total calories from added sugars.

Data Analysis

Day-1 full sample weights were used to represent the population under study. SUDAAN (release 7.5.1, Research Triangle Institute) was used to compare the three groups' mean intakes of food groups, nutrients, and energy. Three pairwise comparisons of the means were made, and linear contrasts were used to separate the means. A probability level of 0.0125 was used to keep the total experimental error rate low, and SAS software package (release 6.12, SAS Institute, Cary, NC) was used to compute all the other estimations.

Results

Group 1 had the lowest intakes of energy and added sugars among the three groups (table 1). Group 1 consumed 1,860 kcal and 26 grams of sugar: 180 to 189 kcal and 45 to 111 grams less than that consumed by the other groups. There were no significant differences in total fat and saturated fat intakes of group 1

Table 1. Mean¹ intakes of energy, macronutrients, and percentage of calories in a day by individuals 2 years and over, by percentage of calories from added sugars

Energy and nutrients	Calories from added sugars					
	Less than 10% (Group 1)		10 to 18% (Group 2)		Above 18% (Group 3)	
Sample	5,058		4,488		5,158	
	<i>Mean</i>	<i>S.E.²</i>	<i>Mean</i>	<i>S.E.²</i>	<i>Mean</i>	<i>S.E.²</i>
Energy (kcal)	1860 ^a	15.0	2040 ^b	18.1	2049 ^b	17.2
Total fat (g)	73 ^a	0.9	78 ^b	0.1	70 ^a	0.8
Saturated fat (g)	24 ^a	0.3	27 ^b	0.4	25 ^a	0.3
Carbohydrate (g)	211 ^a	1.7	256 ^b	2.2	292 ^c	2.4
Protein (g)	81 ^a	0.7	78 ^b	0.7	66 ^c	0.7
Dietary fiber (g)	17 ^a	0.2	16 ^a	0.2	13 ^b	0.2
Added sugars (g)	26 ^a	0.3	71 ^b	0.7	137 ^c	1.3
Percent of calories from total fat (%) ³	35.3		34.4		30.7	
Percent of calories from added sugars (%) ³	5.6		13.9		26.7	

¹Means with identical superscripts are not significantly different from each other at $p < 0.0125$.

²Standard error of the mean.

³No statistical test of significance was done.

Note: Linear contrasts were used to separate the means.

Source: USDA's Continuing Survey of Food Intakes by Individuals 1994-96, Day-1 data.

and group 3, but their fat intakes were lower than those of group 2. The diets of all three groups, however, had more than 30 percent of calories from total fat.

Group 1, consuming less than 10 percent of calories from added sugars, had much higher intakes of protein and dietary fiber than did group 3, which consumed more than 18 percent of calories from added sugars. Although group 1 had a diet with apparently less carbohydrate than did the other two groups, when the added sugars were subtracted from total carbohydrate, the amount of

carbohydrate without the added sugar was the same as that of group 2, and much higher than that of group 3. That is, compared with group 3, group 1 had a diet higher in carbohydrate without the added sugars.

Group 3, having consumed more than 18 percent of calories from added sugars, had the lowest mean absolute intakes of all the micronutrients, especially vitamin A, vitamin C, folate, vitamin B₁₂, calcium, phosphorus, magnesium, and iron (table 2). Group 1 and group 2 had similar intakes of most micronutrients in absolute amounts; the

Table 2. Mean¹ intakes of micronutrients in a day by individuals 2 years and over, by percentage of calories from added sugars

Nutrients	Calories from added sugars					
	Less than 10% (Group 1)		10% to 18% (Group 2)		Above 18% (Group 3)	
Sample	5,058		4,488		5,158	
	<i>Mean</i>	<i>S.E.²</i>	<i>Mean</i>	<i>S.E.²</i>	<i>Mean</i>	<i>S.E.²</i>
Thiamin (mg)	1.6 ^a	0.01	1.7 ^a	0.02	1.5 ^b	0.02
Riboflavin (mg)	1.9 ^a	0.02	2.0 ^b	0.02	1.8 ^c	0.02
Vitamin A (RE)	1080 ^a	23.0	1031 ^a	26.8	850 ^b	20.2
Vitamin E (mg)	8.3 ^a	0.13	8.4 ^a	0.15	7.1 ^b	0.12
Vitamin C (mg)	106 ^a	2.2	101 ^a	1.8	90 ^b	1.5
Niacin (mg)	23 ^a	0.2	23 ^a	0.3	20 ^b	0.3
Vitamin B ₆ (mg)	1.9 ^a	0.02	1.9 ^a	0.02	1.6 ^b	0.02
Folate (mcg)	275 ^a	3.6	272 ^a	3.8	228 ^b	3.6
Vitamin B ₁₂ (mcg)	5.4 ^a	0.18	5.2 ^a	0.23	4.3 ^b	0.13
Calcium (mg)	788 ^a	8.1	838 ^b	10.1	745 ^c	11.0
Phosphorus (mg)	1251 ^a	9.4	1277 ^a	12.5	1130 ^b	11.4
Magnesium (mg)	285 ^a	2.4	277 ^a	3.1	233 ^b	2.6
Iron (mg)	15.6 ^a	0.14	16.1 ^a	0.19	14.1 ^b	0.18
Zinc (mg)	11.5 ^a	0.15	11.6 ^a	0.15	10.1 ^b	0.13
Copper (mg)	1.2 ^a	0.01	1.2 ^a	0.01	1.1 ^b	0.01

¹Means with identical superscripts are not significantly different from each other at $p < 0.0125$.

²Standard error of the mean.

Note: Linear contrasts were used to separate the means.

Source: USDA's Continuing Survey of Food Intakes by Individuals 1994-96, Day-1 data.

exceptions were riboflavin and calcium. Group 3 also had the lowest intakes of all the micronutrients as measured by percentages of 1989 Recommended Dietary Allowances (RDA) (table 3). All three groups had mean intakes less than 100 percent of the RDA for vitamin E, calcium, and zinc (6). In addition, group 3 had mean intakes less than 100 for vitamin B₆ and magnesium. A remarkably lower percentage of individuals in group 3 met their RDA for many micronutrients (table 4). However, more or

less similar percentages of individuals in groups 1 and 2 met the RDA for the micronutrients. Whereas about one-fourth of the individuals with a low intake of added sugars (group 1) had energy intakes that equaled or exceeded the Recommended Energy Allowances (REA), about one-third each of the individuals with moderate or high intakes of added sugars did so.

In addition, group 3 (more than 18 percent of calories from added sugars)

Group 3 had the lowest intakes of all the micronutrients.

had the lowest intakes of many food groups: Grain; Fruit; Vegetables; and Meat, Poultry, and Fish (table 5). Individuals with low intakes of added sugars included more fruits; vegetables; and meat, poultry, and fish in their diet, compared with food intakes of the other two groups. Dairy intake was the same for the groups with low (group 1) or high intake (group 3) of added sugars.

Analysis of mean intakes of selected food subgroups shows that group 3 consumed less citrus and noncitrus fruit juices and total fluid milk than did the other two groups (table 6). Also, compared with the other groups, group 3 had the highest intakes of regular fruit drinks, punches, and ades; regular carbonated soft drinks; cakes, cookies, and grain-based pastries; milk desserts; and candies. Group 2 had the second highest intakes, and group 1 had the least intakes of these food subgroups. The increase was more than tenfold between group 1 and group 3 for regular fruit drinks, punches, and ades; and regular carbonated soft drinks.

Additional analysis showed that among males, 34 percent were in group 1; 30 percent, group 2; and 36 percent in group 3. Similar percentages of females were in each group: 33 percent were in group 1; 30 percent, group 2; and 37 percent were in group 3. Forty-four percent of African Americans, compared with 33 percent of Caucasians, were in group 3. Among the individuals from households with income less than 300 percent of poverty, about 40 percent were in group 3, compared with less than one-third who were in group 1. When household income levels were at or above 300 percent of poverty, individuals were about as likely to be in group 3 as in group 1: 34 and 35 percent, respectively.

Table 3. Mean¹ intakes of energy and micronutrients as percentage of 1989 Recommended Dietary Allowances (RDA) in a day by individuals 2 years and over, by percentage of calories from added sugars

Energy and nutrients (% RDA)	Calories from added sugars					
	Less than 10% (Group 1)		10% to 18% (Group 2)		Above 18% (Group 3)	
Sample	5,058		4,488		5,158	
	<i>Mean</i>	<i>S.E.</i> ²	<i>Mean</i>	<i>S.E.</i> ²	<i>Mean</i>	<i>S.E.</i> ²
Energy	81 ^a	0.5	89 ^b	0.8	88 ^b	0.8
Vitamin A (RE)	128 ^a	2.8	125 ^a	3.0	103 ^b	2.4
Vitamin E	95 ^a	1.4	97 ^a	1.6	82 ^b	1.5
Vitamin C	185 ^a	3.9	179 ^a	3.0	163 ^b	2.8
Thiamin	139 ^a	1.2	143 ^a	1.5	124 ^b	1.5
Riboflavin	141 ^a	1.1	148 ^b	1.8	130 ^c	1.7
Niacin	150 ^a	1.1	150 ^a	1.7	129 ^b	1.4
Vitamin B ₆	111 ^a	1.1	112 ^a	1.4	94 ^b	1.1
Folate	167 ^a	2.5	175 ^a	2.5	149 ^b	2.5
Vitamin B ₁₂	289 ^a	9.6	285 ^a	11.8	237 ^b	7.0
Calcium	93 ^a	1.0	97 ^a	1.1	83 ^b	1.2
Phosphorus	149 ^a	1.1	148 ^a	1.4	126 ^b	1.4
Magnesium	104 ^a	0.9	105 ^a	1.4	89 ^b	1.1
Iron	142 ^a	1.4	145 ^a	1.8	124 ^b	1.6
Zinc	87 ^a	1.1	89 ^a	1.1	78 ^b	1.0

¹Means with identical superscripts are not significantly different from each other at $p < 0.0125$.

²Standard error of the mean.

Note: Linear contrasts were used to separate the means.

Source: USDA's Continuing Survey of Food Intakes by Individuals 1994-96, Day-1 data.

Independent of gender, the percentage of individuals with more than 18 percent of calories from added sugars (group 3) increased from the childhood years to the teen years and declined in the adult years (table 7). About one-third of children 2 to 5 years old, and one-half of children 6 to 11 years old were in group 3.

Discussion and Conclusion

High intake of added sugars had a dilution effect on many essential micronutrients—especially vitamin A, vitamin B₁₂, folate, magnesium, and iron—in the diet of Americans 2 years old and over. Individuals who consumed more than 18 percent of calories from added sugars had low intakes of all the five food groups.

Table 4. Percentage of individuals 2 years and over meeting 100 percent of 1989 Recommended Dietary Allowances (RDA) for selected nutrients and energy in a day, by percentage of calories from added sugars

Energy and nutrients (% RDA)	Calories from added sugars		
	Less than 10% (Group 1)	10% to 18% (Group 2)	Above 18% (Group 3)
Sample	5,058	4,488	5,158
	<i>Percent</i>		
Energy	24	32	32
Protein	78	80	70
Vitamin A (RE)	42	44	34
Vitamin E	34	35	26
Vitamin C	59	61	52
Thiamin	68	71	59
Riboflavin	68	72	61
Niacin	74	74	62
Vitamin B ₆	49	50	37
Folate	66	67	55
Vitamin B ₁₂	75	78	73
Calcium	37	39	30
Phosphorus	73	75	62
Magnesium	42	43	31
Iron	62	64	52
Zinc	29	32	23

Note: SAS analysis of weighted data.

Source: USDA's Continuing Survey of Food Intakes by Individuals 1994-96, Day-1 data.

High intake of added sugars had a dilution effect on many essential micro-nutrients...in the diet of Americans 2 years old and over.

And compared with other groups, group 3 had the lowest intakes for all the micronutrients. Thus group 3 had the least nutrient-dense diet. Adequate intake of micronutrients has implications for long-term well-being. A high percentage of the adult skeleton is formed during adolescence (5). Thus adequate intake of calcium during childhood and adolescence is essential. Also increased risk of osteoporosis is associated with

low bone density, which results from inadequate intakes of calcium during the growing years (2).

With the lowest intakes of both energy and added sugars, group 1 did not have a lower percentage of calories from added sugars by eating more of other energy-giving nutrients (thereby increasing the denominator) but by controlling the intake of added sugars.

Although the individuals in group 1 had more than 30 percent of total calories from fat, their absolute mean intakes of total fat and saturated fat were similar to those of group 3 and less than those of group 2. Though only one-fourth of group 1 met their energy requirements, in the cases of micronutrients, the percentage of individuals meeting the recommended nutrient levels were comparable to that of group 2.

Compared with the others, group 3 had a high-energy and a relatively lower fat diet. A study by Kennedy et al. (4), using day-1 data from CSFII 1995, showed that children 6 to 18 years old and females 19 to 50 years old whose diets had less than 30 percent of calories from fat had a higher intake of total sugars and sweets and total beverages (excluding milk and fruit juices). The same study also showed that all adults ages 19 to 50 with diets less than 30 percent of calories from fat and whose diets did not include any fat-modified, lean or lower fat food products had a high intake of regular carbonated beverages.

The study showed that children were more likely to have a diet high in added sugars. Adults over 40 years were likely to have lower added sugar intakes. Within the same age group, the gender did not seem to affect the percentage of caloric contribution of added sugars. Group 3 had high consumption of beverages that are very low in nutrients and high in energy. Because of the increasing prevalence of obesity, consumers will be benefitted by limiting intake of “empty” calories, especially during childhood and adolescence.

Table 5. Mean¹ intakes of Pyramid food group servings in a day by individuals 2 years and over, by percentage of calories from added sugars

Food groups	Calories from added sugars					
	Less than 10% (Group 1)		10% to 18% (Group 2)		Above 18% (Group 3)	
Sample	5,058		4,488		5,158	
	<i>Mean</i>		<i>Mean</i>		<i>Mean</i>	
	<i>S.E.²</i>		<i>S.E.²</i>		<i>S.E.²</i>	
Grain	6.7 ^a	0.08	7.1 ^b	0.07	6.3 ^c	0.07
Fruit	1.8 ^a	0.04	1.6 ^b	0.04	1.2 ^c	0.04
Vegetable	3.7 ^a	0.06	3.5 ^b	0.05	2.9 ^c	0.05
Dairy	1.5 ^a	0.02	1.6 ^b	0.03	1.4 ^a	0.03
Meat, poultry, and fish (ounces)	4.6 ^a	0.06	4.3 ^b	0.07	3.7 ^c	0.07

¹Means with identical superscripts are not significantly different from each other at $p < 0.0125$.

²Standard error of the mean.

Note: Linear contrasts were used to separate the means.

Source: USDA's Continuing Survey of Food Intakes by Individuals 1994-96, Day-1 data.

Table 6. Mean¹ intakes of selected food subgroups in a day by individuals 2 years and over, by percentage of calories from added sugars

Food subgroups	Calories from added sugars					
	Less than 10% (Group 1)		10% to 18% (Group 2)		Above 18% (Group 3)	
Sample	5,058		4,488		5,158	
	<i>Mean</i>		<i>Mean</i>		<i>Mean</i>	
	<i>S.E.²</i>		<i>S.E.²</i>		<i>S.E.²</i>	
Citrus juices	79 ^a	4.1	63 ^b	3.8	42 ^c	2.1
Noncitrus fruit juices and nectars	33 ^a	2.1	28 ^a	1.6	16 ^b	1.3
Total fluid milk	201 ^a	5.6	205 ^a	5.0	160 ^b	3.8
Regular fruit drinks, punches, and ades	12 ^a	1.2	67 ^b	3.0	149 ^c	5.7
Regular carbonated soft drinks	32 ^a	2.1	176 ^b	5.5	515 ^c	14.0
Cakes, cookies, and grain-based pastries	18 ^a	0.8	43 ^b	1.6	53 ^c	1.8
Milk desserts	11 ^a	0.7	27 ^b	1.1	41 ^c	1.8
Candies	2 ^a	0.2	6 ^b	0.4	13 ^c	0.7

¹Means with identical superscripts are not significantly different from each other at $p < 0.0125$.

²Standard error of the mean.

Note: Linear contrasts were used to separate the means.

Source: USDA's Continuing Survey of Food Intakes by Individuals 1994-96, Day-1 data.

Table 7. Percentage of individuals, by age-gender and by percentage of calories from added sugars

Age (years)- gender group	Calories from added sugars		
	Less than 10% (Group 1)	10% to 18% (Group 2)	Above 18% (Group 3)
Sample	5,058	4,488	5,158
		<i>Percent</i>	
All individuals	34	30	36
Child 2-5	29	36	35
Child 6-11	30	31	49
Male 12-18	16	28	56
Female 12-18	17	30	53
Male 19-40	32	31	37
Female 19-40	32	28	40
Male 41 and over	45	30	25
Female 41 and over	43	30	27

Note: SAS analysis of weighted data.

Source: USDA's Continuing Survey of Food Intakes by Individuals 1994-96, Day-1 data.

diet are carbonated soft drinks (27 grams); cakes, cookies, pies, sweet rolls, and other grain-based pastries (11 grams); fruit drinks (excludes fruit juices), punches, and ades (8 grams); dairy desserts (4 grams); and all types of candies (4 grams).

Food labels contain information on total sugars per serving but do not distinguish between sugars naturally present in foods and added sugars. Better information on the food label is needed to help consumers make informed choices regarding added sugars.

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African Americans and low-income individuals were more likely than their counterparts to have high intakes of added sugars. It is possible that foods high in added sugars were less expensive energy sources for at least some of the individuals in the low-income group. Income could play a role in the choice of foods because higher consumption of expensive foods such as fruits and vegetables was associated with diets where added sugars were low.

When the total fat intake meets the recommendations of the *Dietary Guidelines for Americans* (13), the Food Guide Pyramid suggested levels of added sugars are 6, 12, and 18 teaspoons (24, 48, and 72 grams) per 1,600, 2,200, and 2,800 calories of total energy per day, respectively (11). The mean intake of

added sugars for group 3 was 137 grams, which is much higher than these recommended levels.

Data on food disappearance (in the food supply) show that more than three-quarters of the refined and processed sugars reach the consumer through food and beverage industries, and less than one-fourth of the amount produced is brought directly into the home (1). It is important for consumers to recognize that they get large amounts of added sugars through processed foods and beverages. Additional analyses of data from day 1 of the CSFII 1994-96 show that individuals 2 years old and over (N=15,016) consume 20.5 teaspoons (82 grams) of added sugars daily. The top five sources of added sugars and their mean contribution to the daily intakes of added sugars in the

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Household Expenditures on Vitamins and Minerals by Income Level

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A version of this research brief, along with other articles examining the use of food stamps to purchase dietary supplements, appears in "The Use of Food Stamps to Purchase Vitamin and Mineral Supplements" (Food and Nutrition Service, U.S. Department of Agriculture, September 1999).

The Federal Food Stamp Program provides a nutritional safety net for low-income households by giving eligible individuals allotments that may be used to purchase food. These allotments are based on the Thrifty Food Plan, a minimal cost of a nutritious diet in the United States. Although most foods can be purchased with the allotments, dietary supplements (vitamins, minerals, and other nutritional supplements, such as herbal products and amino acids) have been excluded.

The recent welfare reform act (Personal Responsibility and Work Opportunity Reconciliation Act of 1996) required the U.S. Department of Agriculture (USDA) to conduct a "... study of the use of food stamps to purchase vitamins and minerals" (Section 855). One specific request was a study on "... the purchasing habits of low-income populations with regards to vitamins and minerals." To address these purchasing habits, this paper examines low-income households' expenditures on vitamins and minerals and compares their expenditures with those of non low-income households.

Research on dietary supplements has focused primarily on use. One study found that in 1992, 46 percent of the U.S. population reported taking a vitamin or mineral supplement in the past year (9). An earlier study found that in 1987, 23 percent of the population reported

taking a daily vitamin or mineral supplement (13). Characteristics associated with vitamin/mineral use include being female (3,8,12,13), being White (3,5,13), having a higher education (3,5,8), having a higher income (3,5,8), and being older (5,8,13). In addition, residing in the West (3,12), consuming more fruits and vegetables (6), playing a sport (10), and having some health problems (2) were associated with vitamin/mineral use. Multivitamins, vitamin C, calcium, and iron were the most commonly consumed dietary supplements (7,12,13).

Although there has been considerable research on the use of dietary supplements, almost none has focused on people's expenditures and other purchasing habits regarding these supplements. According to industry estimates, total retail sales in 1992 were \$2.7 billion for vitamins, \$0.5 billion for minerals, and \$0.5 billion for other nutritional supplements, for a total of \$3.7 billion (4). Multivitamins and vitamin C supplements account for the largest percentage of these sales (4). According to Applied Biometrics (1), people purchase dietary supplements most often at drugstores, and the main reasons they report taking supplements are to prevent disease and increase energy.

One unused source of information regarding expenditures on dietary supplements is the Diary component

of the Consumer Expenditure Survey (CE). These data were used in this study to examine household purchases of dietary supplements.

Data and Sample

The Diary component of the CE, conducted by the Bureau of the Census for the Bureau of Labor Statistics (BLS), is an ongoing survey that collects data on food and other selected expenditures, income, and major sociodemographic characteristics of consumer units. A consumer unit consists of either (1) all members of a particular household who are related by blood, marriage, adoption, or other legal arrangements; (2) two or more people living together who pool their incomes to make joint expenditure decisions; or (3) a person living alone or sharing a household with others or living as a roomer in a private home or lodging house or in permanent living quarters in a hotel or motel, but who is financially independent.

A national sample of consumer units, representing the civilian noninstitutionalized population, was selected and asked to keep an expenditure Diary, which covers two consecutive 1-week periods. Every year the CE surveys about 5,000 different consumer units throughout the year. Each week of diaries is deemed an independent sample by BLS.

For this study, data from the 1994 CE Diary were used. The 1-week diaries were linked so that information on a consumer unit's food and other selected expenditures could be obtained for a 2-week period. This was done because it is unlikely that people purchase dietary supplements on a weekly basis. Only units that were complete income reporters and contained only one household in the

housing unit were included. Complete income reporters provide values for major sources of income, such as wages and salary, interest and dividends, and Social Security. Consumer units with one household (the two terms will be used interchangeably from this point on) were included to avoid confusion over which household made the purchase.

Low-income households were then selected from the data set. Low income was defined as having before-tax income less than or equal to 130 percent of the poverty threshold for a respective household size. This definition is used to determine eligibility for food stamps. The final sample consisted of 833 low-income households. To place the expenditures and other characteristics of these households in perspective, USDA researchers also selected a random sample of 833 non low-income households. (Non low-income households were defined as those with before-tax income above 130 percent of the poverty threshold for a respective household size.)

The CE public-use tape contains information on total over-the-counter drug purchases of households; 216 of the low-income households and 305 of the non low-income households had over-the-counter drug purchases. The individualized expenditures constituting these over-the-counter drug purchases, such as expenditures on aspirin, cough medicine, and vitamins or minerals, are recorded in the actual CE diaries but are not reported on the public-use tapes. To obtain expenditures on vitamins or minerals, a USDA team of researchers examined the actual diaries of the 521 (low-income and non low-income) households reporting expenditures in the over-the-counter drug category. These diaries are located at BLS; working at BLS, the USDA team used identification numbers to match

data on the public-use tape and the diaries. In the diaries, consumer units recorded purchases of vitamins or minerals by type (e.g., vitamin C or calcium), brand name (e.g., One-A-Day or Centrum), or simply as "vitamin or mineral." The respondent chose how to record these purchases. Because researchers could not group these purchases (with a reasonable degree of accuracy) by type of vitamin or mineral, all purchases of vitamins and minerals were totaled.

Other nutritional supplements (e.g., amino acids and herbs) were grouped under "other" food. BLS provided a list of all households with such expenditures in the 1994 CE, and researchers examined these diaries for purchases of other nutritional supplements. Few households reported expenditures on these other dietary supplements, and almost none were in the sample of 1,666 low-income and non low-income households. Expenditures on these other dietary supplements were, therefore, not examined in this study. Some of these other nutritional supplements could be listed simply as "other" food, so the actual percentage of people purchasing them is higher. Consequently, these cases could not be identified.

Results

The characteristics of the low-income sample (table 1) are consistent with Census findings of the low-income population (14). Most heads or co-heads of low-income households¹ were not married, had a high school diploma or less, and were either under 30 or over 59 years old. Most low-income households reported not receiving food stamps in the past year. This may

¹The head or co-head was defined as the person who owns or rents the home; in cases of joint ownership or renting status, the head or co-head is decided arbitrarily.

Table 1. Characteristics of households, by income, 1994

Characteristics	Low-income households n = 833	Non low-income households n = 833
	<i>Mean</i>	
Before-tax income*	\$8,780	\$45,560
Weekly food expense*	\$54	\$87
Household size	2.6	2.6
	<i>Percent</i>	
Age (years)*¹		
Less than 30	21	14
30 - 39	19	24
40 - 49	14	24
50 - 59	9	14
60 and over	37	24
Education*¹		
Less than high school	41	13
High school diploma	29	31
Some college	22	24
College degree	8	32
Race*¹		
White	77	89
Non-White	23	11
Family type*		
Husband-wife with children	20	33
Husband-wife without children	9	23
Single-parent with children	17	5
Single	36	24
Other ²	18	15
Housing tenure*		
Own	42	72
Rent	58	28
Food stamp receipt*		
Receive	31	2
Do not receive	69	98
Region*		
Urban		
Northeast	16	20
South	29	26
Midwest	23	20
West	18	21
Rural	14	13

*Significant difference at .05 level.

¹Age, education, and race are for the reference person or household head or co-head, who is the person who owns or rents the home; when there is joint ownership or renting status, the head or co-head is decided arbitrarily.

²Other consists of husband-wife and single-parent families residing with others, besides their own children, and grandparents and others providing primary care for children.

seem surprising; however, eligibility for food stamps requires an asset and income qualification. Also, many households eligible for food stamps do not participate in the program; they are unaware of their eligibility or choose not to apply (11).

Most characteristics between low-income and non low-income households were significantly different (at the .05 level); the exception was household size.

Weekly food expenses were less for low-income households than for non low-income households, although their household size was the same. A higher percentage of low-income households had a head or co-head that was either less than 30 or over 59 years old, had less than a high school diploma, and were non-White. In addition, a higher percentage of low-income households were headed by a single parent or single person, rented their home, and received food stamps. A small percentage of non low-income households (2 percent) reported receiving food stamps in the past year. Although the overall income of non low-income households makes them ineligible for food stamps, they may have qualified for some month in the previous year because of temporary unemployment or another reason.

Of the 833 low-income households in the sample, only 30 had purchased vitamins or minerals (3.6 percent), and of the 833 non low-income households, 51 had purchased vitamins or minerals (6.1 percent) (table 2). The low percentage of households reporting vitamin or mineral expenditures over a 2-week period was surprising. Analysis of the USDA's 1994 Continuing Survey of Food Intakes by Individuals revealed that 30 percent of all individuals reported taking a dietary supplement every day or almost every day. Why this large discrepancy? Typically, dietary

For low-income households with the expense, the average expenditure on vitamins and minerals over 2 weeks was \$8.58....

Table 2. Vitamin and mineral expenditures by households over a 2-week period, by income, 1994

	Low-income households	Non low-income households
Percent of households with expenditure* ¹	3.6	6.1
Average expenditure of those with expense ²	\$8.58	\$10.76

*Significant difference at .05 level.

¹Percentages based on sample of 833 low-income households and 833 non low-income households.

²Average based on 30 low-income households and 51 non low-income households.

supplements are purchased in relatively large quantities, such as containers with 100 or more capsules. Households would likely consume the product over a few weeks; they will not need to replenish the product every other week.

For low-income households with the expense, the average expenditure on vitamins and minerals over 2 weeks was \$8.58, and it ranged from \$0.99 to \$35.90. Most of these households had vitamin or mineral expenditures under \$10 for the 2-week period. For non low-income households with the expense, the average expenditure was \$10.76. It ranged from \$0.10 to \$75 and was not significantly different from that of low-income households. Most of these households also had vitamin or mineral expenditures under \$10 for the 2-week period.

Conclusion

Over a 2-week period, few low-income households purchased vitamins or minerals. Because a 2-week period is unlikely to capture most expenditures on vitamins and minerals, many more low-income people are likely to have purchased supplements. To get a clearer picture

of expenditures on dietary supplements by low-income households, researchers need to track these expenditures over a longer time. The CE does have an Interview component that examines households' expenditures over a 3-month period. This component collects overall food expenditures and expenses on other major budgetary components. However, it does not contain expenses on dietary supplements. Given how frequently households purchase dietary supplements, it would be better to use the Interview component of the CE to collect such expenses.

Other studies by the Center for Nutrition Policy and Promotion will examine the dietary supplement behavior of low-income people. These studies will provide policymakers with a better understanding of the dietary supplement behavior of the low-income population upon which policy may be based.

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Insight 12

The following is a reprinted *Nutrition Insights*, a publication of the Center for Nutrition Policy and Promotion.

The Diet Quality of American Indians: Evidence From the Continuing Survey of Food Intakes by Individuals

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and Promotion

The diet of American Indians (including Alaskan Natives) has not been studied extensively. To shed more light on the overall diet quality of American Indians, this *Nutrition Insight* examines their diet by using the Healthy Eating Index (HEI). The HEI, computed on a regular basis by the U.S. Department of Agriculture (USDA), is a summary measure of people's overall diet quality. Data used to compute the Index are from the 1994-96 Continuing Survey of Food Intakes by Individuals, a nationally representative survey containing information on people's consumption of foods and nutrients and the most recent data available to compute the HEI.

Although the sample size of American Indians in the survey is small (107 people) and does not include American Indians in all States, this Insight serves as an initial indication of the diets of this group. The diets of American Indians vary by tribe (Lakota vs. Navajo) and by personal characteristics (young vs. old). The sample size, however, prevented more detailed analysis by such factors. Survey weights were used in the analysis.

The average age of American Indians in the survey is 31, and the average household size is 2.6. There is an approximate even split between the number of males and females. Household income averages \$21,800. These characteristics of American Indians are similar to those of the rest of the U.S. population, with the exception of income that is significantly lower. American Indian households are much more likely to report "sometimes or often not [having] enough food to eat," compared with other households (9 vs. 2 percent). Analysis of the Food Security Supplement of the 1995 Current Population Survey confirmed this result.

Healthy Eating Index Components

The Healthy Eating Index score is the sum of 10 components, each representing different aspects of a healthful diet:

- Components 1-5 measure the degree to which a person's diet conforms to the USDA's Food Guide Pyramid serving recommendations for the five major food groups: Grains (bread, cereal, rice, and pasta), vegetables, fruits, milk (milk, yogurt, and cheese), and meat (meat, poultry, fish, dry beans, eggs, and nuts).

- Components 6 and 7 measure total fat and saturated fat consumption, respectively, as a percentage of total food energy (calorie) intake.
- Components 8 and 9 measure total cholesterol and sodium intake, respectively.
- Component 10 measures variety in a person's diet (the number of different foods that a person eats in a day).

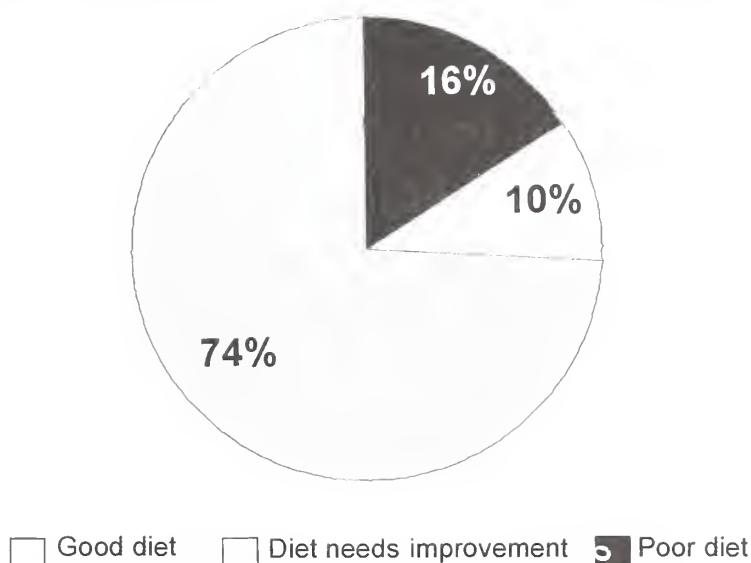
Each component of the Index has a maximum score of 10 and a minimum score of zero. Intermediate scores were computed proportionately. The maximum overall score for the 10 components combined is 100. High component scores indicate intakes close to recommended ranges or amounts; low component scores indicate less compliance with recommended ranges or amounts. An HEI score above 80 implies a good diet; an HEI score between 51 and 80 implies a diet that needs improvement; an HEI score less than 51 implies a poor diet.

Healthy Eating Index for American Indians

The mean HEI score for American Indians is 65. Only 10 percent of American Indians have a good diet (fig. 1). Sixteen percent of American Indians have a poor diet, and 74 percent have a diet that needs improvement. There is no statistically significant difference in the overall diet quality of American Indians and the rest of the U.S. population. For example, 11 percent of White Americans have a good diet; 73 percent, a diet that needs improvement; and 16 percent, a poor diet.

American Indians score best or highest on the cholesterol component of the HEI, compared with other components (fig. 2). American Indians' cholesterol score averages 7.8 on a scale of zero to

Figure 1. Healthy Eating Index rating for American Indians, 1994-96



10. (High component scores indicate intakes close to recommended ranges or amounts.) American Indians' variety score is their second highest score (7.6). The fruits component of the HEI has the lowest mean score (4.7) for American Indians, and the milk component has the second lowest score (5.2). Other HEI component scores are generally between 6 and 7, a pattern similar to that of the rest of the U.S. population.

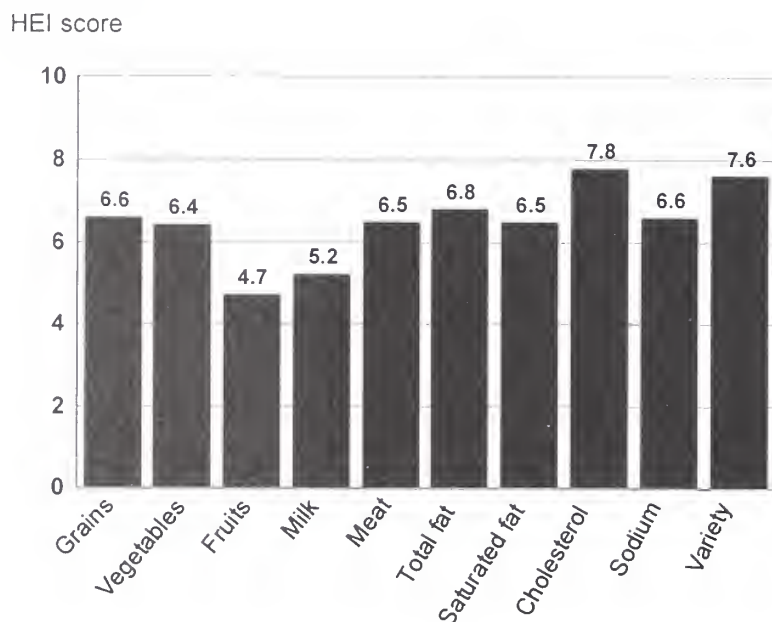
Less than 50 percent of American Indians have a maximum score for 8 of the 10 HEI components—that is, they meet the dietary recommendations (fig. 3). For fruits, only 21 percent of American Indians meet the dietary recommendation on a given day; for grains, 24 percent; and for milk products, 27 percent. For cholesterol, 71 percent of American Indians meet the dietary recommendation. For each of the HEI components, there is no statistically significant difference in scores between American Indians and the rest of the U.S. population.

Summary

Based on the sample of American Indians used in this analysis, the results suggest that their diet needs improvement—as does the diet of the rest of the U.S. population. American Indians particularly need to improve their consumption of fruit and milk products. There likely is variation in the diets of American Indians by tribe and by personal characteristics. Future survey efforts to increase the sample of American Indians would permit a more detailed portrayal of this population. Nutrition professionals could use these results in nutrition education and promotion activities to help improve the diets of American Indians.

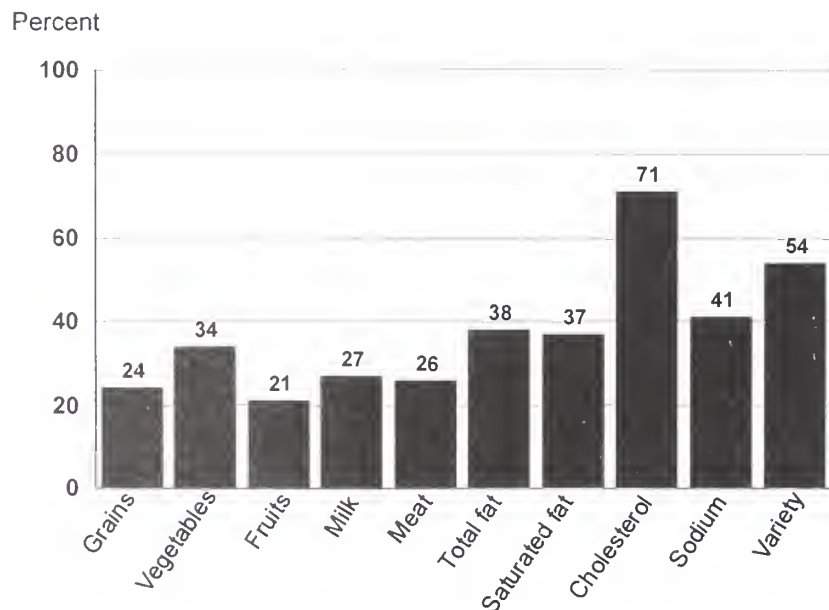
The authors thank Margaret Andrews, Ph.D., of USDA's Economic Research Service for the analysis of the Food Security Supplement of the 1995 Current Population Survey.

Figure 2. Healthy Eating Index: Component mean scores for American Indians, 1994-96



Note: For more details on the Healthy Eating Index and how it is computed, the reader should see Bowman, S.A., Lino, M., Gerrior, S.A., and Basiotis, P.P. 1998. *The Healthy Eating Index: 1994-96*. U.S. Department of Agriculture, Center for Nutrition Policy and Promotion. CNPP-5. Available at <http://www.usda.gov/cnpp>.

Figure 3. Percentage of American Indians meeting the dietary recommendations for each component of the Healthy Eating Index, 1994-96



Supplemental Security Income Program Participation by Noncitizens

The Supplemental Security Income (SSI) program is a nationwide, means-tested public assistance program designed to provide a minimal income to aged, blind, and disabled individuals whose incomes and resources are below levels specified in Title XVI of the Social Security Act. SSI is administered by the Social Security Administration (SSA). To be eligible for SSI, an individual must be a resident of the United States and a U.S. citizen, a U.S. national, or a qualified alien in an SSI-eligible non-citizen category.

Eligible noncitizens include those who were SSI beneficiaries on August 22, 1996, and qualified aliens—those who were blind or disabled and lawfully residing in the United States but not receiving SSI on August 22, 1996. Other circumstances that can enable a noncitizen to be eligible for SSI include being:

- a refugee (during the 7 years after being admitted as a refugee);
- an asylee (during the 7 years after asylum was granted);
- a noncitizen who has had deportation or removal withheld (during the 7 years after);
- an Amerasian immigrant (during the 7 years after entry);

- a Cuban or Haitian entrant as defined in the Refugee Education Assistance Act of 1980 (during the 7 years after status was granted);
- a qualified alien who is on active duty in the Armed Forces or an honorably discharged veteran and his or her spouse and dependent children; or
- a lawfully admitted permanent resident who has earned 40 qualifying quarters of coverage. Also, a child would be credited with all quarters of coverage earned by the parent while the child was under age 18. A married individual would be credited with all quarters of coverage earned by the spouse during the marriage.

A noncitizen otherwise eligible for SSI who has an immigration sponsor and who recently entered the country with a legally enforceable affidavit of support (as required by the Immigration and Naturalization Service [INS]) generally is not eligible for SSI because the sponsor's income and resources are considered to be the noncitizen's for purposes of the SSI means-test. Referred to as "deeming," this attribution continues until the noncitizen becomes a U.S. citizen or earlier if 40 qualifying quarters are earned by the individual or a parent or a spouse.

The original legislation specified that the only noncitizens who would be eligible for SSI benefits would be those who were admitted lawfully for permanent residence or otherwise residing permanently in the United States under color of law. Although applicants for SSI who were not U.S. citizens were always required to present evidence of their lawful admission, their citizenship status was not recorded until

Table 1. Number of immigrants admitted annually

Fiscal year	Number
1980	530,639
1985	570,009
1990	1,536,483
1991	1,827,167
1992	973,977
1993	904,292
1994	804,416
1995	720,416
1996	915,900

September 1978. In 1979 SSA identified almost 18,000 noncitizen recipients: about 6 percent of all awards during the preceding 8 months. Beginning in 1982, the development of valid and reliable sample files from the Supplemental Security Record (the basic administrative file for the SSI program) made it feasible to track changes in the number and characteristics of recipients. Data reported here are based on these sample files.

Immigration and SSI Applications

As of April 1996, INS identified about 10.5 million "Legal Permanent Residents" in the United States, about half of whom had been in this country long enough to apply for naturalization. The number of immigrants per year has varied, peaking in 1990 and 1991 (table 1). The number of noncitizens applying for SSI increased from 51,500 in 1982 to 162,100 in 1993. From 1994 through 1997, this upward trend changed when the number of alien applicants decreased each year. Much of this decrease is attributable to a decline in the number of noncitizens age 65 and older applying for SSI.

SSI Recipients

In December 1982, noncitizens were 3 percent of total recipients (table 2). The percentage increased each year until 1995, when noncitizens composed 12 percent of SSI recipients. Legislative changes in 1996 and 1997, including Public Law 104-193 in 1996, modified the eligibility requirements for SSI payments to noncitizens. Current recipients were urged to clarify their citizenship status. Also, files were reviewed to find information that would allow SSA to update citizenship status. Thus the

Table 2. Percentage of SSI recipients who were noncitizens, by eligibility category, 1982-97

December	Percent of		
	Total SSI	All aged	All blind/disabled
1982	3.3	5.9	1.6
1983	3.9	7.0	1.9
1984	4.5	8.3	2.1
1985	5.1	9.7	2.4
1986	5.7	11.2	2.8
1987	6.4	12.9	3.2
1988	7.2	14.9	3.5
1989	8.1	17.1	4.0
1990	9.0	19.4	4.6
1991	10.2	22.5	5.2
1992	10.8	25.4	5.6
1993	11.4	28.2	5.9
1994	11.7	30.0	6.2
1995	12.1	31.8	6.3
1996	11.0	29.5	5.9
1997	10.0	27.0	5.5

Source: SSI 10-percent sample file.

same individuals may have continued to receive payments—they just were no longer counted as noncitizens, and by the end of 1997, only 10 percent of total recipients were noncitizens. As a percentage of all aged on SSI, noncitizens increased to about 32 percent in 1995, then dropped to 27 percent in 1997. The percentage of blind or disabled SSI recipients who were noncitizens peaked at over 6 percent in 1994 and 1995.

Characteristics of Noncitizen SSI Recipients in December 1997

In December 1997, about 650,000 of the 6.5 million SSI recipients were noncitizens. More than three-quarters of noncitizen recipients of SSI in December 1997 lived in just five States: California (39 percent), New York (16 percent), Florida (10 percent), Texas (8 percent), and Massachusetts (4 percent). State distribution of all Legal Permanent Residents as identified by the INS in April 1996 shows 68 percent lived in these same five States. Among all SSI recipients, 40 percent lived in these States.

Noncitizen recipients were significantly older than all SSI recipients, with two-thirds being 65 years or older, compared with less than one-third of all SSI recipients (table 3). About 1 percent of the noncitizens were under age 18, compared with about 14 percent of all SSI recipients. Noncitizens were 62 percent women, compared with 59 percent of all SSI recipients.

Noncitizens who get SSI were more likely to live in a household headed by someone other than themselves or their spouse (11 percent, compared with 4 percent of all SSI recipients). For SSI

Table 3. Percentage distribution of all SSI recipients and noncitizens, by selected characteristics, December 1997

Characteristic	All SSI recipients	Noncitizen recipients
	<i>Percent</i>	
Total	100.0	100.0
Age (years)		
Under 18	13.5	1.0
18 to 39	22.7	7.0
40 to 49	12.8	6.1
50 to 64	19.3	18.1
65 to 74	16.7	37.8
75 or older	15.0	30.0
Sex		
Male	41.3	37.7
Female	58.7	62.3
Living arrangements		
Own household	82.1	86.8
Another's household	4.1	10.6
Parents' household	11.4	1.0
Medicaid institution	2.3	1.5
Unknown	.1	.2
Income		
Social Security	37.1	21.4
Worker	23.9	15.6
Auxiliary	13.2	5.7
Earnings	4.5	1.6
Type of SSI payment		
Federal SSI only	63.5	33.6
State supplement only	4.4	4.3
Both	32.2	62.1

Source: SSI 10-percent sample file, December 1997.

purposes, this means that the recipient receives significant support from that household head, and this reduces the maximal monthly Federal SSI payment by one-third.

Among all SSI recipients, 37 percent also received a monthly benefit from the Old Age, Survivors, and Disability Insurance (OASDI) program. The average payment was \$371. Noncitizen SSI recipients were less likely to receive an OASDI benefit—21 percent—and the benefit was smaller, \$352, on average, each month. Noncitizens were far less likely to receive an auxiliary benefit as a spouse, widow, or child. Also, they were less likely to have earnings in addition to their SSI payment.

Noncitizens received both Federal SSI and a State-supplementation payment more often than did citizens, 62 and 32 percent, respectively. California, Massachusetts, and New York, where many noncitizens live, have substantial supplementation programs. Average payments from both sources were \$351 for all SSI recipients and \$433 for noncitizens. This difference also reflects the lack of other income for noncitizens, part of which would reduce the Federal SSI payment.

Almost 90 percent of the noncitizens who received SSI had immigrated to the United States from Latin America (42 percent), Asia (35 percent), or one of the countries that formerly made up the Soviet Union (12 percent). The five largest countries from which noncitizens emigrated were Mexico, the former Soviet Republics, Cuba, Vietnam, and China. Only those from Vietnam were more often eligible on the basis of blindness or disability than age.

Two-thirds of noncitizen recipients did not apply for SSI until 3 years after their arrival, probably because of “sponsor deeming.” Attributing the income and resources of an immigrant sponsor to the applicant for purposes of determining the Federal SSI payment could, in many cases, reduce the payment to zero. Thus those noncitizens (i.e., refugees and asylees) who did apply for SSI less than 3 years after they came to the United States were either exempt from the deeming provision or the income of their sponsor was quite low.

The percentage of noncitizen recipients who were 65 years or older has declined: from 88 percent in 1982 to 77 percent in 1992 and 68 percent in 1997. This reduction indicates that more noncitizens have become eligible based on blindness or disability. The percentage of noncitizens who receive a Social Security benefit in addition to SSI has grown very slightly—from 19 percent in 1982 to 21 percent in 1997.

In conclusion, with the current eligibility rules, we may expect a continuing decline in the number of noncitizen recipients. Reasons are twofold: on-going recipients will become citizens or leave the rolls, and the number of new applicants will decline.

Source: Parrott, T. M., Kennedy, L. D., and Scott, C.G., 1998, Noncitizens and the Supplemental Security Income program, *Social Security Bulletin* 61(4):3-31.

A Dietary Assessment of the U.S. Food Supply

Information on how diets differ from Federal dietary recommendations is key to Federal efforts to monitor the dietary and nutritional status of the population. This study compares average diets for the 1970-96 period, as determined through food supply data, with Federal dietary recommendations depicted in the Food Guide Pyramid. Also, a method was devised to adjust the data for food spoilage and other losses incurred throughout the marketing system and the home. Because estimates of servings are derived from consumption data for raw and semi-processed agricultural commodities rather than for final food products, food servings can be readily converted back to farm-level data for establishing production and supply goals for farmers and the food industry.

Estimates were from the time-series food supply data compiled by the U.S. Department of Agriculture's (USDA) Economic Research Service (ERS). Therefore, the data may be used as a baseline to project future trends in food demand and to compare these trends against the serving recommendations depicted in the Food Guide Pyramid.

Methods of Dietary Assessment

The Food Guide Pyramid is being used in a food-based approach that recognizes the link between diet and the risk of chronic disease. Food consumption data are assessed by using serving recommendations specified by the Food Guide Pyramid.

The food supply series estimates the quantity of food available for human consumption in the U.S. food marketing system by tracking commodity flows from production to end uses. Because it has continually measured food and nutrient availability since 1909, the food supply estimates are most often used as indicators of trends over time. These data also have limitations: the amount of food actually ingested by humans is overstated because nonedible food portions, waste and spoilage, and foods used as ingredients in processed foods that are exported are included in the estimates.

The Continuing Survey of Food Intakes by Individuals (CSFII) measures food eaten by individuals by recording food intake over a specific period—2 non-consecutive days in the 1994-96 survey. Demographic data are also collected and allow researchers to assess dietary status among population groups. Food-intake surveys, such as the CSFII, that collect data on food consumption through recalls or food records are subject to under-reporting—especially in terms of energy intake. These data allow researchers to compare the amount and types of foods available in the food supply with actual food intakes.

Translating Food Supply Data into Food Servings

A multistage process was used to convert aggregate estimates of the food supply into food servings comparable with those specified in the *Food Guide Pyramid* bulletin. Servings were estimated for more than 250 individual food commodities or commodity groups that were divided into the five major Pyramid

food groups (grains, fruits, vegetables, dairy products, and meat/meat alternates) or separate groups for fats and oils and added sugars.

Annual per capita estimates of the food supply were then converted into daily servings and compared with the serving recommendations depicted in the Food Guide Pyramid. The food supply data were adjusted for spoilage and other waste. Depending on the commodity, several different types of losses were identified and estimated—including are retail and foodservice and consumer losses, changes in weight due to cooking, and the discard of nonedible food parts. Losses averaged 27 percent across all food groups, but rates varied between some food groups.

Single-serving weights were defined for each commodity in the food supply by using serving weights identified in USDA's Nutrient Data Base for Standard Reference. The selected food portion was the one that most closely resembled the serving size defined in the *Food Guide Pyramid* bulletin. Because some serving recommendations specified in the Food Guide Pyramid are product based, rather than ingredient based, serving weights for some foods were not consistent with standard serving sizes defined by dietary guidance.

Daily per capita consumption was divided by the assigned serving weight to calculate average servings for that commodity. Individual food servings were then summed to determine total daily servings for each Pyramid food group. The difference between the total number of daily servings for each food group provided by the food supply and

the serving recommendations reported in the Food Guide Pyramid was measured.¹

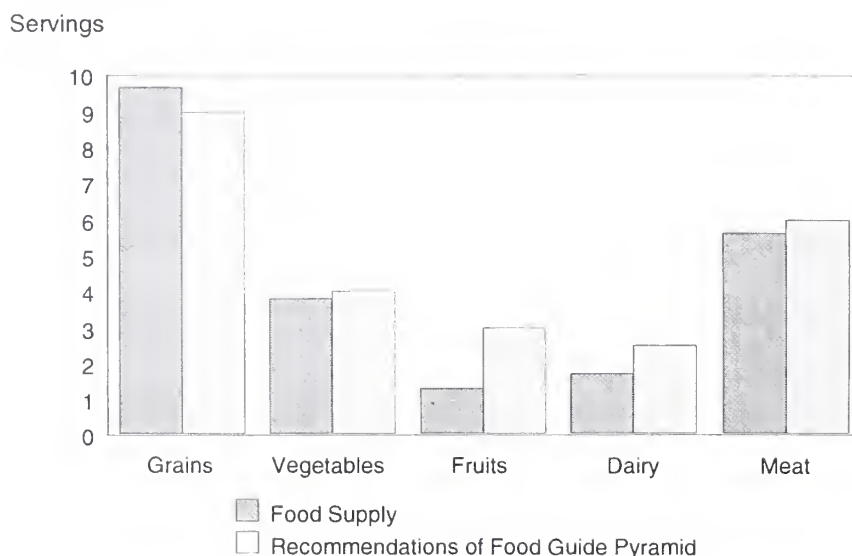
Findings

Estimated servings provided by the food supply for 1996 suggest that the average American diet is out of balance with serving recommendations depicted by the Food Guide (fig. 1). Average consumption falls short of recommended servings for vegetables, fruits, dairy products, and meats. In 1996 the grains group is the only food group where total servings met recommendations for a 2,200-calorie diet.

Breads, cereals, rice, and pasta—In 1996 the food supply provided an estimated 9.7 daily servings of grain products, well within the 6-11 daily servings recommended for all Americans age 2 and older. Thus many individuals likely met the recommendation in the Food Guide Pyramid: 9 daily servings appropriate to a 2,200-calorie diet. In 1970 total daily servings of grain products numbered only 6.8. This suggests that many consumers are heeding nutrition education messages to increase their consumption of grain products.

Almost half of the increase in servings since 1970 can be attributed to higher consumption of white and whole-wheat flour, a twofold increase in durum flour (used for pasta) and corn products (used for snack chips and Mexican-style food

Figure 1. For four food groups, servings from Food Supply were less than recommendations¹ specified by Food Guide Pyramid, 1996



¹Recommended servings were the midpoint of the recommended Pyramid servings for each food group, based on a sample diet of 2,200 calories.

such as tortillas), and a threefold increase in rice consumption. Many grain products, however, are relatively high in fats, oils, and added sugars and contribute little in the way of fiber and micronutrients found in whole-grain breads, cereals, and other grain products. The CSFII servings data for 1996 confirm that consumption of foods made with whole grains—1 serving per day, on average—was well below dietary guidance recommendations.

Vegetables—The food supply in 1996 provided a daily average of 3.8 servings of fresh, frozen, and canned vegetables, and dry beans, peas, and lentils—close to the 4 daily servings recommended for a 2,200-calorie diet. Between 1970 and 1996, average consumption grew by about 20 percent (half a daily serving of

vegetables). Supporting documentation for the Food Guide Pyramid suggests that consumers should evenly divide their daily servings of vegetables among three vegetable subgroups: Dark-green leafy and deep-yellow, starchy (including dry beans, peas, and other lentils), and other vegetables. Further, the Food Guide Pyramid documentation suggests that for optimal health benefits, consumption would be evenly divided among these three subgroups, and dark-green leafy vegetables should average 0.6 servings each day.

In 1996, however, average consumption of vegetables was heavily weighted toward starchy vegetables, especially white potatoes. Consumption of these starchy vegetables suggests that consumers may not be incorporating adequate variety

¹The recommended servings used in this study were the midpoint of the recommended Pyramid servings for each food group, based on a sample diet of 2,200 calories. A 2,200-calorie diet was chosen as a standard because it approximates the daily Recommended Energy Allowance (REA) of 2,247 calories for the United States that is derived from a population-weighted average of REA's for different age and gender groups of the population.

into their daily choices of vegetables. Although the food supply for this group includes estimates for about 80 different vegetables, about half of the total servings of vegetables for 1996 were supplied by head lettuce, potatoes for freezing, fresh potatoes, potatoes for chips and shoe-strings, and tomatoes for canning (fig. 2).

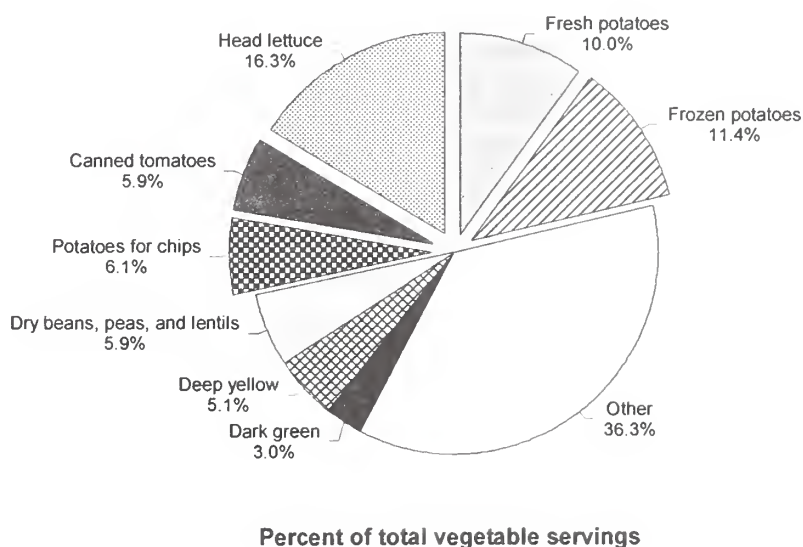
In 1996 the food supply provided one-tenth of a daily serving of dark-green leafy vegetables—less than one-quarter of the recommended daily servings. Broccoli and Romaine lettuce accounted for most of these servings. According to the 1996 CSFII, mean daily intake of dark-green leafy vegetables was about 0.2 servings, or about 6 percent of total vegetable servings. Thus both data sources report similar findings: consumers are not incorporating dark-green leafy vegetables into their daily vegetable choices.

The food supply provided less than one-fourth of a daily serving of deep-yellow vegetables, about one-third of recommended servings. Most (more than three-quarters) servings of deep-yellow vegetables were some form of carrots.

The food supply provided more than the recommended servings of starchy vegetables, mostly white potatoes. However, average consumption of dry beans, peas, and lentils was one-third of recommended levels, with the food supply providing about one-quarter serving a day.

Fruits—The food supply in 1996 provided 1.3 servings per person per day of fresh and processed fruits and fruit juices, less than half the recommendations of the Food Guide Pyramid: 3 servings for a 2,200-calorie diet. The number of servings of fruit available from the food supply has increased about 20 percent since 1970, or about one-quarter of a serving.

Figure 2. Five foods accounted for half of total vegetable servings in 1996



Total servings of fruit were almost evenly divided between two subgroups—citrus, melons, and berries (0.6 servings) and other fruit (0.7 servings). About half of the total servings of fruit came from six foods—orange juice (18 percent), bananas (10 percent), fresh apples (8 percent), watermelon (6 percent), apple juice (6 percent), and fresh grapes (5 percent). It appears that consumers may not be incorporating adequate variety into their daily fruit choices.

Milk, Yogurt, and Cheese Group—Because dairy products supply 73 percent of the calcium in the food supply (and calcium is essential for the formation and maintenance of bones and teeth), requirements increase significantly for those in adolescence and early adulthood, as well as for women who are pregnant and lactating. Also, inadequate calcium intake appears to be an important risk factor for osteoporosis, a disease that

weakens the body's bone structure and is responsible for more than 1 million fractures each year. As a result, the dairy group is the only food group for which serving recommendations specified by the Food Guide Pyramid are based on age and physiological status rather than on energy intake. Three servings are suggested for teenagers, young adults up to 24 years old, and pregnant or lactating women; 2 servings are recommended for children and most adults.

In this study, average servings were compared with a weighted average equivalent to 2.2 servings per day. In 1996, the food supply provided 1.7 servings of dairy foods, suggesting that most Americans are not meeting dietary recommendations. Total servings have remained nearly constant since 1970.

More than half of the dairy servings provided by the food supply in 1996 came

from two dairy products that are naturally high in fat—cheese (38 percent) and whole milk (16 percent). Reduced fat, 2-percent milk (15 percent), 1-percent milk (5 percent), and skim milk (16 percent) account for over one-third of dairy servings in the food supply.

Between 1982-86 and 1992-96, Americans reduced their consumption of whole milk by more than one-third, while nearly doubling their consumption of skim and 1-percent milk. During this period, there was a 20-percent increase in per capita cheese consumption, most of which is about as high in total and saturated fat per serving as whole milk. Thus consumers may be substituting one high-fat dairy product for another with little net reduction in total dairy fat intake.

Meat, Poultry, Fish, Dry Beans, Eggs, and Nuts Group (meat group)—The food supply provided the equivalent of 5.6 ounces of cooked meat per person per day, close to the recommended intake of 6 ounces for a 2,200-calorie diet. However, commodity data suggest that, on average, the food supply is providing larger quantities of foods (relative to others in the group) that are naturally high in fat, saturated fat, and cholesterol. Despite a 36-percent increase in servings of poultry since 1982-86, red meat (beef, veal, pork, and lamb) accounted for 52 percent of total meat equivalent servings in 1996, double the 27-percent poultry share. Fish and shellfish accounted for 7 percent; eggs, 9 percent; and peanut butter, 2 percent of the servings of the meat group.

The addition of dry beans, peas, and lentils to the meat group would increase total daily servings of the meat group from the food supply to 5.8 ounces. As previously stated, supplies of these foods are well below those needed to

fulfill the vegetable group recommendation, and even further short of the combined quantity needed for the vegetable and meat requirements. Together with nuts and seeds, dry beans, peas, and lentils are naturally high in several vitamins and minerals that are present in relatively small quantities in animal products and seafood, making them a desirable low-cost, lowfat, and high-fiber alternative to meat, poultry, and fish.

The Pyramid Tip: Added Fats and Oils—The food supply provided 60 grams of added fats and oils² in 1996, up from the 56 grams available for consumption in 1982-86. Added fats and oils are those that are added in cooking, at the table, and by food manufacturers in many processed food products such as baked goods, French fries, snack foods, and peanut butter. In 1996, fat grams from added fats and oils alone accounted for 82 percent of the recommended upper daily limit of total fat intake—about 33 percent of total calories for a 2,200-calorie diet. The *1995 Dietary Guidelines* recommend that people limit total fat consumption to no more than 30 percent of daily energy intake—about 73 grams for a 2,200-calorie diet. Added fats and oils accounted for 52 percent of the total fat in the food supply in 1994, according to food supply nutrient data. This suggests that the quantity of added fats available for human consumption would have to decline by more than one-third to bring added fat consumption to 38 grams (73 grams of total fat x 0.52).

The Pyramid Tip: Added Sugars—The food supply data for added sugars and other caloric sweeteners measure the delivery of refined cane and beet

sugar, corn sweeteners, and edible syrups to U.S. food and beverage manufacturers. Except for table sugar, the data do not measure the consumption of individual products. The food supply provided an average of 32 teaspoons of caloric sweeteners daily in 1996. This was more than two and one-half times the 12 teaspoons of added sugars suggested, in *The Food Guide Pyramid* bulletin, as an upper limit for a 2,200-calorie diet and 16 percent higher than the 27 teaspoons provided by the food supply in 1982-86.

Dietary guidance focuses on added sugars because foods high in added sugars often supply additional calories but few nutrients. To the extent that consumers substitute the calories from less nutrient-dense sugary snacks, sweetened soft drinks, and baked goods for nutrient-rich foods such as fruits, vegetables, and whole grains, their dietary intake of fiber, vitamins, and minerals found in less nutrient-dense foods may be reduced.

Estimates of the servings provided by the U.S. food supply reported here represent the first attempt to measure changes in food consumption over a continuous period by using the Food Guide Pyramid as a dietary assessment tool. Both this study and the CSFII for 1994-96, which estimated Food Guide Pyramid servings from food-intake data, conclude that most consumers have a long way to go to bring their diets closer to serving recommendations specified by the Food Guide Pyramid. The substantial differences in serving estimates for the two data sets for some food groups suggest the need for additional research to determine the reasons for these differences.

²These fats are consumed in addition to the naturally occurring fat in meat, fish, nuts, eggs, and dairy foods.

Source: Kantor, L.S., 1998, *A Dietary Assessment of the U.S. Food Supply*, Agricultural Economic Report No.772, U.S. Department of Agriculture, Economic Research Service.

Who Gained the Most During the 1990's Expansion?

The economic expansion that began in March 1991 has been widely touted as the longest peacetime expansion of the last 50 years. By implication, Americans should be enjoying rising household incomes and expanded economic opportunities. This study examines whether this has happened and how the fruits of the expansion have been shared by Americans of different income levels.

A closer look at the recovery reveals that marked differences existed between the first phase of the expansion, from 1991 to 1993, and the second phase, from 1993 to 1996. During the 1991 to 1993 period, the four lower income groups experienced income *losses*. Only the very rich, who constitute the top 5 percent of the population, benefitted substantially. By contrast, during the 1993 to 1996 period, all groups experienced at least some income growth. Still, it took until 1995 for the incomes of the lower three income groups to surpass their 1991 levels.

The Expansion's Effect on Income Groups

To determine what happened during both phases of the 1990's recovery, the author examines the effects of the expansion between 1991 and 1996 on households in five income groups or quintiles of the total population.

- Low income—Up to \$14,768
- Low-middle income—\$14,769 to \$27,760
- Middle income—\$27,761 to \$44,006
- Upper-middle income—\$44,007 to \$68,015
- High income—Above \$68,015

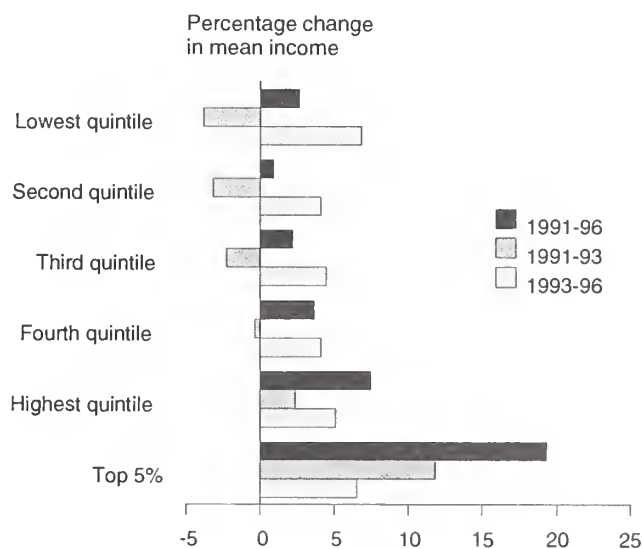
These household income figures represent the total annual amount of cash income of all members residing within a single housing unit. Cash income includes wages and salaries, self-employment income, interest, dividends, government cash welfare, and pensions.

Very different income profiles were created during the two phases of the recovery. During 1991 to 1993, the four lower income quintiles showed slight income *losses* (-0.3 to -3.8 percent).

Even the highest quintile showed only a modest 2.4-percent increase in income. Only the top 5 percent of the population benefitted substantially, with an almost 12-percent increase over the 3-year period.

Interestingly, during the expansion, the lowest and the highest income groups experienced the largest income changes. The top 5-percent income group enjoyed an overall increase of 19.3 percent over the 6-year period, much of which came from the large increase during 1992 to 1993 (9.6 percent). The lowest income group experienced the largest losses during 1991 to 1993 (-3.8 percent) and the largest gains during the 1993 to 1996 recovery (6.8 percent). The middle quintiles, on the other hand, experienced more moderate results each year, with gains and losses of roughly 1 percent annually (fig. 1).

Figure 1. Changes in household income by quintile, 1991-96, 1991-93, and 1993-96



Low-Income Households

Wages earned by low-income households declined during the current expansion. Between 1991 and 1996, both men and women in the lower deciles of the wage distribution experienced declines in real wages (fig. 2). The low- and low-middle income groups include a large percentage of people who are unemployed, on welfare, or receive food stamps. The effect of wage stagnation on these two quintiles can be seen in the large number of people receiving food stamps (25.5 million) and those living below the poverty line (36.5 million). Low-income individuals who receive welfare payments—which are not indexed to inflation—saw their buying power erode substantially during the recovery. Between 1991 and 1995, average monthly benefits per family declined 13.1 percent in real 1995 dollars.

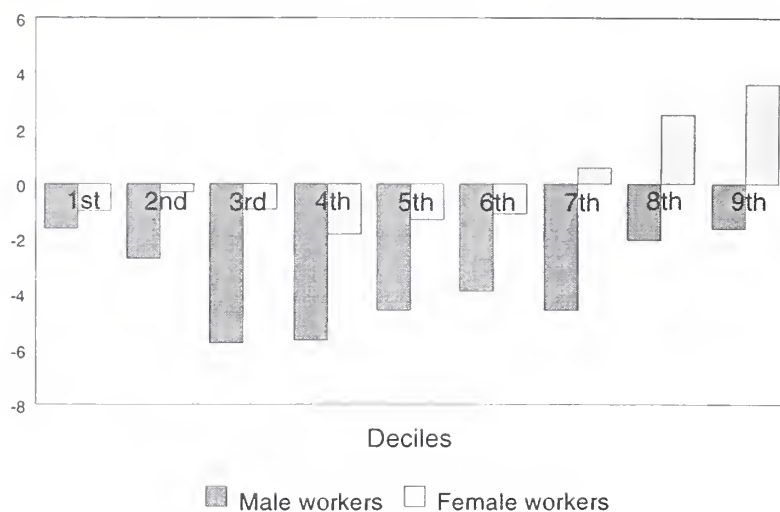
The one bright spot for the low-income group is the decline in unemployment. So many new jobs were created in the current expansion that the number of people on welfare began declining even before the implementation of the welfare reform measures. Since 1991, unemployment has continued to decline steadily, reaching the lowest levels in more than a generation. Indeed, higher employment levels and an increase in the average number of hours worked are the primary reasons for the net gain in income, despite stagnating wages, by the low-income group.

High-Income Households

For the highest income quintile, household income in 1996 started at \$68,015, and the mean was \$115,514. Working men in this group were concentrated in the top 10 percent of earners; working women, the top 20 percent of women earners. Most of the members of this

Figure 2. Change in hourly wages for men and women, by wage deciles, 1991 to 1996

Percentage change
from 1991 to 1996



income group worked in highly paid occupations: such as law; medicine; software-systems engineering; and industries such as finance, computers, and communications. Income gains in the 1990's expansion were asset- and skill-intensive; the gains were oriented towards wider economic opportunities to women. This income group was well equipped to benefit from the expansion and did so.

The top 5 percent of households with the highest income fall within this quintile. In 1996, the lower limit of the top 5 percent started at \$119,540 and had a mean income of \$201,220. In 1995, the median net worth for the top 5 percent was about \$500,000. For those in the lower 15 percent of the high-income quintile, the median net worth was about \$250,000. Median stock holdings were about \$50,000 for the low end and about \$100,000 for the high end.

Assets and stock holdings at this level accumulate significant amounts of income, which may be used to increase current consumption or saved for retirement and other uses. Moreover, the return on stock holdings has been excellent in the 1990's. Between March 1, 1991, and December 1, 1997, the Standard and Poor's 500 Average rose 1.5 times, and the Dow Jones Industrial Average rose 2.7 times. This rise in asset value is likely to widen the gap at retirement time between income groups that accumulated stock-based savings in the 1990's and those that did not.

Comparison With Other Expansions

The 1990's recovery is the second weakest post World War II recovery in terms of per capita GDP (Gross Domestic Product) growth, posting a

\$100.09 average quarterly increase (through the 4th quarter of 1996). Averages ranged from \$91.75 to \$176.08 for the five other recoveries. Equally telling: the income for individuals in four of the five income groups did not recover to the 1989 level (the peak year of the 1980's expansion), despite 6 years of recovery; the exception was the high-income group.

Conclusion

Unequal distribution of gains in income during an economic expansion is unwelcome news. A widening income gap exacerbates the economic conditions of lower income groups, limits opportunities for upward mobility, and makes the American dream an increasingly elusive concept for most Americans. This paper shows that policies that will help equalize income gains or boost the income of poorer groups are highly desirable.

The paper concludes that Congress, the Administration, and the Federal Reserve should pursue ways of boosting wages and closing the income gap. Three broad recommendations emerge.

- Policies that are proexpansionary but noninflationary should be maintained.
- Policies that shift income to, and create opportunities for, individuals without a high school education continue to be needed.
- Policies should be enacted to encourage the middle-income and low-middle income groups to save and invest.

Source: Klein, B.W., 1998, *The 1990's Economic Expansion: Who Gained the Most?* Working Paper Series, Joint Economic Committee Minority, United States Congress.

The Food-at-Home Budget: Changes Between 1980 and 1992

According to the recommendations from recent medical studies, to achieve better health, consumers need to lower their consumption of red meats and increase the amount of fiber and complex carbohydrates by eating more breads, rice, pasta, and fresh fruits and vegetables. Although data on per capita food consumption from the U.S. Department of Agriculture (USDA) suggest that some changes in dietary patterns have occurred, these figures rely on estimates of food disappearance and may not reflect accurately changes in actual food intake.

This study examined how nationwide food consumption patterns have changed and whether these patterns appear to be consistent with consumers' knowledge of nutrition. Data from the Diary portion of the 1980 and 1992 Consumer Expenditure Surveys (CE) were used to analyze differences over time for shares of total food spending for various demographic groups. An index was developed to account for the influence of price changes on shares and to estimate the change in quantities of specific foods consumed relative to all food consumed. CE data were also used to determine whether the probability of purchasing certain types of food has changed and to estimate income elasticities of selected food groups for different demographic groups. Demographic characteristics examined include the age of the reference person, family income level, race, and marital status of the reference person.

The Share Index

The CE provides expenditures on specific foods—not quantities purchased. Therefore, to determine whether food-purchasing habits have changed, researchers use an alternative approach to examine how the total food budget is allocated, incorporating price changes into the analysis. The share index compares shares over time after the Consumer Price Index (CPI) is used to adjust them. Price changes for specific food items can be compared with the change in overall food-at-home prices. If the share of total food expenditures for a particular food item in 1992 is different from the share in 1980, and if the difference cannot be accounted for by price changes alone, then, at least relative to total food purchased, the amount of the specific food item purchased must have changed over time.

A share index with a value greater than 1.0 indicates the quantity purchased of the specific item has risen relative to the total quantity of food purchased; a share index with a value less than 1.0 indicates the quantity purchased has declined. Because the share index controls for price changes, it eliminates false interpretations that might arise from looking at changes in the share of total food at home, only. The share index does not measure absolute changes in quantities of food purchased.

For example: in 1980, the meat-poultry-fish-eggs category accounted for 34.4 percent of total expenditures for food at home but dropped to 26.4 percent in 1992 (table 1). During that period, prices for meat-poultry-fish-eggs rose 42.3 percent compared with 54.8 percent for all food at home.¹ If quantities purchased

¹This means that meat-poultry-fish-eggs cost 1.423 times more in 1992 than they did in 1980 and all food at home, 1.548 times more.

of meat-poultry-fish-eggs and of total food at home remained constant, the share in 1992 should have been about 92 percent of the 1980 level (1,423/1,548) or about 31.6 percent of the food budget. Because they accounted for only 26.4 percent, the quantities purchased of meat-poultry-fish-eggs declined relative to total food consumption, for a share index value of 0.83 (26.4/31.6).

Share Index Results

For most demographic groups, the share indexes for cereal and bakery products and for other food at home (includes frozen meals) indicate an increase in relative purchases of products between 1980 and 1992. More varieties of frozen meals were marketed as being gourmet-style foods or low in calories. Also, ownership of microwave ovens increased as did the number of dual-income families, making leisure time more valuable and prepared foods more affordable. For all other food items (meat-poultry-fish-eggs, dairy products, and fruits and vegetables), the indexes show a relative drop in purchases.

The share of the food budget allocated for eggs was reduced by almost half for most groups between 1980 and 1992. The share index for fish and seafood indicates a decrease in purchases between 1980 and 1992, likely because prices increased more (3.4 percent) per year than did those of beef (2.7 percent) or poultry (0.8 percent). The share index for fresh fruits and vegetables also declined, reflecting the fact that prices rose faster than prices of any other foods. Among families that reported purchases, real (inflation-adjusted) mean expenditures

Table 1. Changes in food purchases, all consumer units, 1980 and 1992

Item	1980	1992	Percent change in CPI, 1980-92	Share index
<i>Percent</i>				
Share of food at home				
Food at home	100.0	100.0	54.8	-
Cereal and bakery products	12.9	15.8 ¹	80.6	1.05
Cereal and cereal products	4.2	5.4 ¹	82.1	1.09
Bakery products	8.7	10.4 ¹	79.5	1.03
Meat, poultry, fish, and eggs	34.4	26.4 ¹	42.3	.83
Beef	13.2	8.1 ¹	34.5	.71
Pork	7.3	6.0 ¹	56.0	.82
Other meats	4.6	3.6 ¹	41.3	.86
Poultry	4.5	4.7	40.2	1.15
Fish and seafood	2.8	2.9	73.4	.92
Eggs	1.9	1.1 ¹	22.2	.73
Dairy products	13.5	11.6 ¹	41.4	.94
Fresh milk and cream	7.1	5.1 ¹	36.4	.82
Other dairy products	6.4	6.5	48.3	1.06
Fruits and vegetables	14.8	16.5	89.3	.91
Fresh fruits	4.3	4.9 ¹	117.2	.81
Fresh vegetables	4.2	4.9 ¹	99.9	.90
Processed fruits	3.5	3.9 ¹	67.7	1.03
Processed vegetables	2.8	2.9	55.0	1.03
Other food at home	24.4	29.7 ¹	43.9	1.31
Sugar and other sweets	3.6	3.9 ¹	47.1	1.14
Fats and oils	2.9	2.8	45.4	1.03
Miscellaneous foods	8.8	14.8 ¹	67.6	1.55
Nonalcoholic beverages	9.2	8.2 ¹	25.1	1.10

¹Change in share is statistically significant at the 95-percent confidence level.

Table 2. Food purchases, 1980 and 1992

Item	Share index		
	Low income	Middle income	High income
<i>Percent</i>			
Share of food at home			
Food at home	-	-	-
Cereal and bakery products	.99	1.04	1.10
Cereal and cereal products	.97	1.04	1.22
Bakery products	.99	1.04	1.06
Meat, poultry, fish, and eggs	.94	.82	.76
Beef	.93	.69	.59
Pork	.94	.84	.67
Other meats	.85	.90	.85
Poultry	1.06	1.10	1.27
Fish and seafood	.89	.77	.98
Eggs	.72	.73	.67
Dairy products	.96	.98	.92
Fresh milk and cream	.86	.86	.78
Other dairy products	1.08	1.11	1.03
Fruits and vegetables	.90	.92	.95
Fresh fruits	.76	.88	.85
Fresh vegetables	.86	.83	.99
Processed fruits	1.02	1.10	1.00
Processed vegetables	1.07	1.00	1.04
Other food at home	1.18	1.30	1.38
Sugar and other sweets	1.08	1.14	1.23
Fats and oils	.90	1.06	1.03
Miscellaneous foods	1.43	1.55	1.61
Nonalcoholic beverages	1.04	1.11	1.15

in the direction of change were found. The exception was for fats and oils: the share index for the youngest group indicated a 9-percent decrease, compared with a 6-percent increase for the oldest group.

Income

Families with lower incomes have less flexibility than higher income families to adjust their food expenditure patterns should prices of foods change. Also, reference persons and main-meal planners in families with lower incomes have lower levels of education, so they may not be as informed about health issues.

The share indexes of those in the highest income group were most likely to indicate a change in a more healthful direction. For example, the share indexes for cereal and bakery products and fresh vegetables were higher in the highest income group than in other income groups (table 2). In contrast, share indexes for meat-poultry-fish-eggs and dairy products were lower in the highest income group, compared with other income groups. Share indexes for other food at home were also highest for the highest income group. Among specific foods, consumption of beef and pork declined least in the lowest income group, and poultry consumption increased most in the highest income group. Expenditures for eggs decreased most for the highest income group.

Gender

Only families consisting of a single person where the person making purchasing decisions and the reference person must be one and the same were examined to determine whether gender of the reference person influenced purchasing decisions. Analysis showed that there were few differences in expenditure shares by gender in 1980 and none in 1992. Share indexes for meat-poultry-

for fresh fruits declined from \$3.35 to \$2.29 and for fresh vegetables, from \$3.28 to \$2.52. However, the percentage of all families reporting expenditures for fruits and vegetables increased from 75 percent in 1980 to 78 percent in 1992.

Age

Older people have different health concerns than younger people and so may be more inclined to eat carefully; life-long eating habits may be difficult to change, however. When share indexes were examined by age, few differences

fish-eggs, however, declined more for women than for men. The indexes for fruits and vegetables were the same for both men and women and indicated a decrease in purchases. Whereas men cut back more on fresh vegetables and less on fresh fruits, women cut back more on fresh fruits and less on fresh vegetables. Women increased their purchases of sugar and sweets but not those of fats and oils; men decreased their purchases of sugar and sweets and increased those of fats and oils.

Race

Blacks spent larger shares than did Whites and others on pork, poultry, fish and seafood, and eggs in both 1980 and 1992. Blacks increased their consumption of fish and seafood between 1980 and 1992, whereas Whites and others increased their consumption of poultry.

Logit Regression Results

Logit analysis was used to estimate the probability that a particular family would purchase a certain type of food, given the family's characteristics. An increase in the probability of purchasing suggests that more families are reporting purchases of the food rather than an increase in the number of purchases by families that already consume the food regularly. Various demographic characteristics were held constant, and predictions were made for specific groups of families. For example, if the effect of age on the probability of purchasing was the characteristic to be isolated, the "control" family was compared with another family with identical characteristics except for age. Families that did not report purchases of groceries (about 11 percent) were eliminated from the sample because the probability that the family buys any specific food is zero.

The control family was defined as a family consisting of a husband, wife, and one child; in the middle-income group; living in an urban area; not participating in the Food Stamp Program; participating in the Diary survey in the spring (April, May, or June); and whose reference person is 35 to 64 years old, not Black, and never attended college. The control group exhibited statistically significant decreases in the probability of purchasing items from four food groups: Meat (5 percent), fish and seafood (6 percent), eggs (14 percent), and dairy products (4 percent). These food groups contain foods that are high in saturated fat (dairy products), cholesterol (seafood), or both (eggs and meat). Changes in probability are not statistically significant for any other food groups.

Age and Income

Families whose reference person was age 65 and over were more likely to purchase meat, poultry, eggs, dairy products, and fats and oils than were younger families in both 1980 and 1992. Older consumers had a higher probability of purchasing fruits and vegetables than did younger consumers.

Low-income families had a significantly lower probability of purchasing meat than the control group had in both 1980 and 1992. Middle- and high-income families appeared to have similar probabilities in both years for purchasing every food group.

Gender

Single men showed a statistically significant increase in the probability of purchasing meats: from 67 percent in 1980 to 70 percent in 1992; single women, a decrease: from 68 to 65 percent. Single women were more likely than single men to purchase fats and oils in 1980.

Compared with men, women had a higher probability of purchasing dairy products in 1980; both men and women had lower probabilities of purchasing dairy products in 1992 than in 1980. Single men had a lower probability of purchasing fruits and vegetables (72 percent) than did single women (81 percent) in 1980. The probabilities increased in 1992 for both genders.

Race

Except for poultry, Black families' probabilities of purchasing food in 1992 were not statistically distinguishable from those of White and other families. In 1980, however, Black families were more likely to purchase fish and seafood and less likely to purchase dairy products, fruits and vegetables, fats and oils, and other foods than White and other families.

Education

The probability of purchasing meats decreased substantially (about 10 percentage points) between 1980 and 1992 for college graduates. Families with a reference person who was a college graduate also showed declines in the probability of purchasing eggs and fats and oils.

Income Elasticities

Income elasticity is used in this article to show by what percentage expenditures for a selected food group are expected to increase given a 1-percent increase in income. An increase in income elasticity over time indicates that it takes less of an increase in income to induce a purchase of a particular item than it did before. Real expenditures and real incomes were averaged for each group across time to be certain that differences in observed elasticities were due to changes in tastes and other factors influencing expenditures and not just differences

in incomes. Price elasticities were not estimated because the CE lacks data on prices, but the analysis presented here does control for price changes over time.

As expected, the individual food categories were income inelastic in each year; that is, a 1-percent increase in income meant an increase of less than 1 percent in expenditures for each individual food category. There are, however, three distinct groups into which the food categories fall: those for which elasticities increased over time for most population groups (cereal and bakery products, fish and seafood, and other food at home); those for which elasticities were positive in 1980 for most groups and did not change over time (beef, pork, and other meats, dairy products, and fruits and vegetables); and those for which elasticities were statistically indistinguishable from zero in both years (poultry, eggs, and fats and oils).

Expenditures in the last group are called "perfectly inelastic," indicating that quantities purchased do not change with income. Expenditures in the other groups are called "necessities" because their elasticities are greater than zero but less than unity (one). No "luxury" foods (those with elasticities greater than unity) were found. "Other food at home," which includes a substantial amount of convenience foods, showed increasing elasticities for almost every demographic group. More and more frozen meals have become popular each year as microwave ownership has increased.

Age

Elasticity varied little with the reference person's age. However, the elasticities for meat were larger for families 65 and older than they were for younger families. Elasticities for fish and seafood also

appeared to differ by the reference person's age: significant for families headed by a reference person over 35 years old but not so for families headed by younger reference persons.

Gender

Single men and women had very similar elasticities for cereal and bakery products, poultry, and other food at home in both 1980 and 1992. Single men had a higher elasticity for fruits and vegetables than did single women in both years and for fish and seafood in 1992.

Race

Black families had an income elasticity that was both positive and significantly different from zero for fish and seafood in 1992 and fruits and vegetables in 1980. White and other families had increasing elasticities for cereal and bakery products, fish and seafood, and other food at home. Elasticities were significantly different from zero for White and other families for meat (1980), poultry (1992), dairy products (1980 and 1992), fruits and vegetables (1980 and 1992), and fats and oils (1992).

Conclusion

In general, findings indicate that consumers were reacting to the ever-changing news about relationships of food to health, but some demographic groups responded differently than others. It appears that consumers were substituting poultry for meats with a higher fat content and were reducing their consumption of eggs. However, the consumption of fruits and vegetables has declined, although most demographic groups were purchasing them more frequently. Both consumption and frequency of purchasing fish and seafood declined for most demographic groups. Income elasticities for fish and seafood have

increased substantially, indicating expenditures increased more rapidly with income in 1992 than in 1980.

Further work analyzing trends by demographic groups should provide further insight into changing food expenditure patterns, especially as more data on nutritional attitudes and awareness become available.

Source: Paulin, G.D., 1998, The changing food-at-home budget: 1980 and 1992 compared, *Monthly Labor Review* 121(12): 3-32.

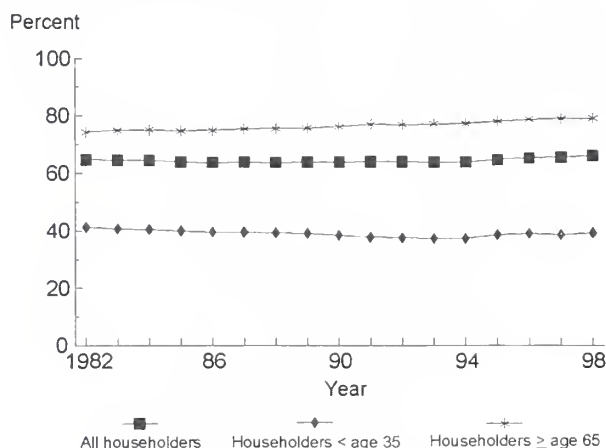
Federal Statistics: Homeownership

Homeownership often has been thought of as part of the American dream. Many public policies, such as the mortgage interest rate deduction in the income tax system, are aimed at increasing homeownership. The percentage of people owning a home has slightly increased over the past two decades. This percentage, however, varies by age and race. Also, owning a home is an expensive undertaking, which is typically done by borrowing money via a home mortgage.

Homeownership increasing slightly but varies by age:

The percentage of householders (heads or co-heads of households) owning a home increased from 64.8 to 66.3 percent between 1982 and 1998. Over this period, 1998 marked the highest rate of homeownership. This trend, however, varied by age of the householder. Householders less than 35 years old experienced a small decrease in homeownership while householders 65 years old and older experienced an increase over this time.

Homeownership rate, 1982-98

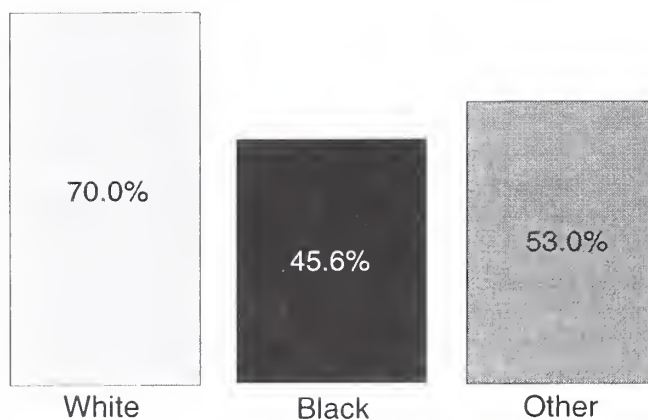


Source: U.S. Census Bureau, *Housing vacancies and homeownership annual statistics: 1998*, *Housing Vacancy Survey—Annual 1998: Table 15*, [On-line], Available: <http://www.census.gov/ftp/pub/hhes/www/housing/hvs/annual98/ann98t15.html>

Large differences in homeownership by race:

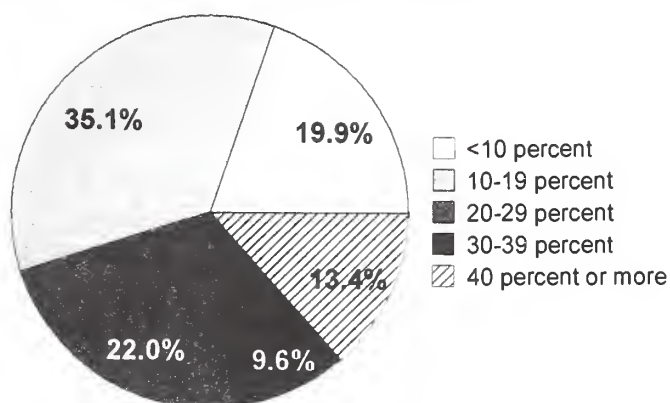
By race, differences in homeownership are large. In 1998, whereas 70.0 percent of White householders owned a home, only 45.6 percent of Black householders and 53.0 percent of householders of a race other than White or Black (i.e., Asian, American Indian) owned a home. The large homeownership differences by race likely reflect the lower income of Blacks and others relative to the income of Whites, therefore making homeownership less affordable.

Homeownership by race of householder, 1998



Source: U.S. Census Bureau, *Housing vacancies and homeownership annual statistics: 1998*, *Housing Vacancy Survey—Annual 1998: Table 20*, [On-line], Available: <http://www.census.gov/ftp/pub/hhes/www/housing/hvs/annual98/ann98t20.html>

Monthly housing costs as a percentage of income, 1995

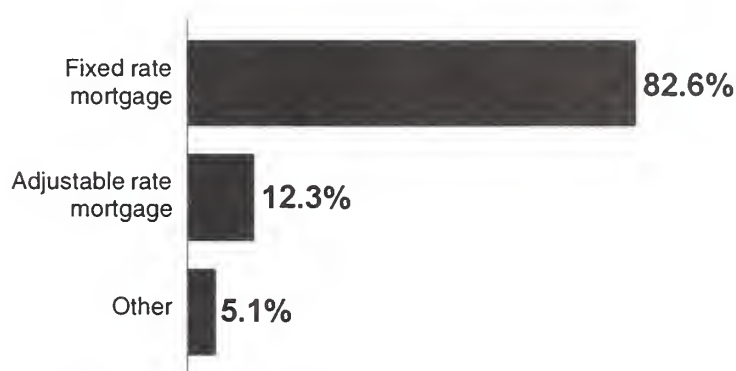


Source: U.S. Census Bureau, 1998, *Statistical Abstract of the United States: 1998*, Table No. 1218.

Homeownership can be very costly:

Housing costs are often one of the largest components of a family's budget. In 1995 (the most recent year data are available), median monthly housing costs, on average, were 19 percent of before-tax family income for homeowners. For 19.9 percent of homeowners, monthly housing costs were less than 10 percent of family income; for 13.4 percent of homeowners, monthly housing costs were 40 percent or more of family income.

Type of mortgage or housing units with mortgage, 1995



Source: U.S. Census Bureau, *American Housing Survey—1995 AHS-N Data Chart Table 3-17*, [On-line], Available: <http://www.census.gov/hhes/www/housing/ahs/95dtchrt/tab3-15.html>

Fixed rate mortgage still dominant:

Because of the high cost of homeownership, most people purchase a home by borrowing money via various types of home mortgages. The fixed rate mortgage is the norm in the United States. In 1995, of all housing units with a mortgage, the primary payment plan for 82.6 percent of homeowners was a fixed rate mortgage. The primary payment plan for the remainder was either an adjustable rate mortgage or some other type of mortgage (e.g., graduated payment or balloon payment).

Journal Abstracts

The following abstracts are reprinted verbatim as they appear in the cited source.

Neumark-Sztainer, D., Story, M., Perry, C., and Casey, M.A. 1999. Factors influencing food choices of adolescents: Findings from focus-group discussions with adolescents. *Journal of the American Dietetic Association* 99(8):929-934, 937.

This snapshot of adolescent attitudes toward food and eating behavior reveals that this age group's food choices are shaped by a variety of interrelated factors, ranging from basic hunger and food cravings to complex social influences such as family meal habits or time-crunched lifestyles. Comments collected from 141 boys and girls in grades 7 and 10 identified factors such as a food's flavor, smell, and appearance; time available for preparing and eating meals; parental attitudes and behaviors regarding food and eating; and the eating environment (eg, whether eating with friends vs family members) as key influences on a young person's food choices. Major barriers to eating more fruits, vegetables, and dairy foods and fewer high-fat foods were a lack of a sense of urgency regarding personal health in relation to other concerns and taste preferences for other foods. Successful teen-focused interventions must aim to make healthful foods taste and look more appealing, limit unhealthful food options, engage parents to teach healthful eating habits when children are young, and shape social norms to make it "cool" to eat healthfully.

Firestone, J.M., Harris, R.J., and Lambert, L.C. 1999. Gender role ideology and the gender based differences in earnings. *Journal of Family and Economic Issues* 20(2):191-215.

Much of the research on gender differences in occupational earnings still focuses on human capital and the structure of the labor market. However, these variables rarely explain even half of the gender gap in earnings. Most research has examined the impact of gender role ideology as it impacts occupational choice, which indirectly can impact earnings. Using data from the National Opinion Research Center General Social Surveys, this research focuses on the relationship between attitudes about gender roles and two variables: (a) earnings, and (b) occupational positions held by women and men. Findings show that traditional gender-role ideology contributes to lower observed earnings for *both* males and females, independent of the influences of human capital characteristics, occupational context, and ascribed characteristics. Results support socialization as a partial explanation for the gender-based earnings differences and suggest that, to the extent that economic rewards are used to assess the value of gender role expectations, traditional gender role attitudes might continue to change and lead to relatively equal earnings among women and men.

Allison, D.B., Zannolli, R., and Narayan, K.M.V. 1999. The direct health care costs of obesity in the United States. *American Journal of Public Health* 89(8):1194-1199.

Objectives. Recent estimates suggest that obesity accounts for 5.7% of US total direct health care costs, but these estimates have not accounted for the increased death rate among obese people. This article examines whether the estimated direct health care costs attributable to obesity are offset by the increased mortality rate among obese individuals.

Methods. Data on death rates, relative risks of death with obesity, and health care costs at different ages were used to estimate direct health care costs of obesity from 20 to 85 years of age with and without accounting for increased death rates associated with obesity. Sensitivity analyses used different values of relative risk of death, given obesity, and allowed the relative costs due to obesity per unit of time to vary with age.

Results. Direct health care costs from 20 to 85 years of age were estimated to be approximately 25% lower when differential mortality was taken into account. Sensitivity analyses suggested that direct health care costs of obesity are unlikely to exceed 4.32% or to be lower than 0.89%.

Conclusions. Increased mortality among obese people should be accounted for in order not to overestimate health care costs.

Hampl, J.S. and Betts, N.M. 1999. Cigarette use during adolescence: Effects on nutritional status. *Nutrition Reviews* 57(7):215-221.

Despite numerous anti-tobacco campaigns, smoking among adolescents continues to be a predominant public health issue. This report details the interrelationships between adolescence, smoking, and nutrition and health. Current data indicate that most smokers become nicotine-dependent as adolescents, which places them at risk for chronic diseases associated with continuous oxidative damage. Additionally, nicotine has antidepressant and hyper-metabolic effects, which may be of particular importance during adolescence because nicotine use leads to increased dependence on tobacco, contributes to difficulty in smoking cessation, and promotes weight gain following smoking cessation.

Bianchi, S.M., Subaiya, L., and Kahn, J.R. 1999. The gender gap in the economic well-being of non-resident fathers and custodial mothers. *Demography* 36(2):195-203.

Using a unique sample of couples with children, we estimate the gender gap in economic well-being after marital separation, something that previous studies of individuals who divorce have not been able to do. The income-to-needs levels of formerly married mothers are only 56% [of] those of their former husbands. The postseparation gender gap is reduced if the wife was employed full-time and was an above-average earner before marital disruption. The gap is also relatively small among the least economically independent wives, those who were not employed before separation. For the latter group, the husband's relatively low income tends to reduce the gender gap.

Keenan, D.P., Abusabha, R., Sigman-Grant, M., Achterberg, C., and Ruffing, J. 1999. Factors perceived to influence dietary fat reduction behaviors. *Journal of Nutrition Education* 31(3):134-144.

Dietary change is an inherently complex process. Although dietary fat reduction is an important issue in nutrition education, factors facilitating this type of change have not been fully examined. By accumulating information from individuals who have already been successful in initiating and maintaining dietary fat reduction, practical means of assisting others can be learned. This study collected information from 155 participants between the ages of 30 and 55. Participants were included if they reported the initiation of sustained dietary fat reduction strategies beginning at least 5 years prior to recruitment. Data used to examine individual patterns of dietary fat reduction were collected via in-depth, semistructured, retrospective interviews. Qualitative analyses identified 134 factors that played a role in facilitating the adoption of multiple fat reduction strategies. The factors identified were further classified into two categories: unplanned and planned. Unplanned factors were defined as life events or occurrences that are not nor should they be intentionally included in one's life as a means of dietary improvement (e.g., market influence, health issues, disease diagnosis). Planned factors were defined as occurrences often intentionally included in one's life to facilitate dietary change (e.g., going on a weight loss diet, acquiring an appliance, making a resolution). They frequently resulted from mediation by an unplanned factor. These factors can be used to help nutrition educators identify specific times conducive to initiating dietary change, as well as techniques for facilitating dietary fat reduction.

Ono, H. 1998. Husbands' and wives' resources and marital dissolution. *Journal of Marriage and the Family* 60:674-689.

Prominent theories converge in suggesting that a wife's resources are positively related to marital dissolution (i.e., the wife's independence hypothesis), whereas a husband's resources are inversely related to dissolution (i.e., the husband's income hypothesis). Using data from the Panel Study of Income Dynamics (1968-1985), a discrete-time event history analysis identifies modifications required of both hypotheses. First, wife's earnings have a nonlinear, U-shaped relationship to the risk of marital dissolution. Second, the impact of husband's earnings varies as a function of wife's earnings. In particular, when the wife has no earnings, lower husband's earnings have a disruptive effect on the marriage. By contrast, when the wife has earnings, lower husband's earnings have a non-significant impact on marital dissolution. Finally, results fail to support the hypothesis that better economic prospects for a wife, measured by education and time worked, increase the risk of marital dissolution separately from her actual economic standing, measured by her earnings.

Official USDA Food Plans: Cost of Food at Home at Four Levels, U.S. Average, September 1999¹

AGE-GENDER GROUPS	WEEKLY COST				MONTHLY COST			
	Thrifty plan	Low-cost plan	Moderate-cost plan	Liberal plan	Thrifty plan	Low-cost plan	Moderate-cost plan	Liberal plan
INDIVIDUALS²								
CHILD:								
1 year	\$15.50	\$19.10	\$22.40	\$27.30	\$67.20	\$82.80	\$97.10	\$118.30
2 years	15.50	19.10	22.40	27.30	67.20	82.80	97.10	118.30
3-5 years	16.80	20.90	25.90	31.00	72.80	90.60	112.20	134.30
6-8 years	20.80	27.80	34.60	40.30	90.10	120.50	149.90	174.60
9-11 years	24.80	31.50	40.20	46.70	107.50	136.50	174.20	202.40
MALE:								
12-14 years	25.60	35.60	44.10	51.80	110.90	154.30	191.10	224.40
15-19 years	26.30	36.60	45.60	52.70	114.00	158.60	197.60	228.30
20-50 years	28.20	36.40	45.30	54.90	122.20	157.70	196.30	237.90
51 years and over	25.40	34.60	42.70	51.20	110.10	149.90	185.00	221.80
FEMALE:								
12-19 years	25.60	30.60	37.20	44.90	110.90	132.60	161.20	194.60
20-50 years	25.50	31.70	38.70	49.50	110.50	137.40	167.70	214.50
51 years and over	25.00	30.90	38.40	46.00	108.30	133.90	166.40	199.30
FAMILIES:								
FAMILY of 2³:								
20-50 years	59.10	74.90	92.40	114.80	256.00	324.60	400.40	497.60
51 years and over	55.40	72.10	89.20	106.90	240.20	312.20	386.50	463.20
FAMILY OF 4:								
Couple, 20-50 years and children—								
1-2 and 3-5 years	86.00	108.10	132.30	162.70	372.70	468.50	573.30	705.00
6-8 and 9-11 years	99.30	127.40	158.80	191.40	430.30	552.10	688.10	829.40

¹Basis is that all meals and snacks are purchased at stores and prepared at home. For specific foods and quantities of foods in the Low-Cost, Moderate-Cost, and Liberal Plans, see *Family Economics Review*, No. 2 (1983); for specific foods and quantities of foods in the Thrifty Food Plan, see *Thrifty Food Plan, 1999, Executive Summary*, CNPP-7A. The Thrifty Food Plan is based on 1989-91 data, and the other three food plans are based on 1977-78 data updated to current dollars using the Consumer Price Index for specific food items.

²The costs given are for individuals in 4-person families. For individuals in other size families, the following adjustments are suggested: 1-person—add 20 percent; 2-person—add 10 percent; 3-person—add 5 percent; 5- or 6-person—subtract 5 percent; 7- (or more) person—subtract 10 percent.

³Ten percent added for family size adjustment.

Consumer Prices

Average percent change for major budgetary components

GROUP	Annual average percent change from December of previous year to December:			Percent change 12 months ending with September 1999
	1990	1995	1998	
All Items	6.1	2.5	1.6	2.6
Food	5.3	2.1	2.3	2.2
Food at home	5.8	2.0	2.1	2.0
Food away from home	4.5	2.2	2.5	2.3
Housing	4.5	3.0	2.3	2.3
Apparel	5.1	0.1	-0.7	-1.3
Transportation	10.4	1.5	-1.7	4.1
Medical care	9.6	3.9	3.4	3.4
Recreation	NA	2.8	1.2	0.4
Education and communication	NA	4.0	0.7	1.0
Other goods and services	7.6	4.3	8.8	9.2

Price per pound for selected food items

Food	Price per pound unless otherwise noted (as of December in each year)			September 1999
	1990	1995	1998	
Flour, white, all purpose	\$.24	\$.24	\$.28	\$.31
Rice, white, long grain, uncooked	.49	.55	.54	.55
Spaghetti and macaroni	.85	.88	.88	.88
Bread, white	.70	.84	.87	.88
Beef, ground, uncooked	1.63	1.40	1.39	1.48
Pork chops, center cut, bone-in	3.32	3.29	3.03	3.31
Chicken, fresh, whole	.86	.94	1.06	1.08
Tuna, light, chunk	2.11	2.00	2.22	2.05
Eggs, Grade A, large, per dozen	1.00	1.16	1.09	.96
Milk, fresh, lowfat, per gallon	NA	2.31	2.76	2.73
Butter, salted, grade AA, stick	1.92	1.73	3.18	2.63
Apples, red delicious	.77	.83	.85	.97
Bananas	.43	.45	.51	.48
Oranges, navel	.56	.64	.61	NA
Potatoes, white	.32	.38	.38	.41
Lettuce, iceberg	.58	.61	.64	.62
Tomatoes, field grown	.86	1.51	1.80	1.27
Broccoli	NA	.76	.97	1.05
Carrots, short trimmed and topped	.43	.53	.54	.52
Onions, dry yellow	NA	.41	NA	NA
Orange juice, frozen concentrate per 16 oz.	2.02	1.57	1.68	1.83
Sugar, white, 33-80 oz. pkg.	.40	.39	.41	.42
Margarine, stick	.87	.79	NA	NA
Peanut butter, creamy	2.09	1.78	1.79	1.82
Coffee, 100% ground roast	2.94	3.51	3.45	3.39

NA = Data not available.

Selected items from CPI Detailed Reports, Bureau of Labor Statistics, various issues. Price changes are for all urban consumers. Food prices are U.S. city average.

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